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MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

November 1994

14 ONLINE MODELING SOURCES!

R/C ON THE INFORMATION SUPERHIGHWAY–page 58

Flying with THE SOCIETY OF ANTIQUE MODELERS –page 66

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NOVEMBER 1994 VOLUME 122, NUMBER 11

MODEL AIRPLANE NEWS

FEATURES

ABOVE: *at the World Soaring Jamboree, the Nampa, ID, crew prepares to launch Tony Elliot's scale ASH-25. Photo by David D. Garwood.*

ON THE COVER: *Kress Jets' electric P-38 Lightning, reviewed by Clyde Geist in this issue, makes a pass using its unique belt-drive power. Photo by Clyde Geist. Inset: the 1935 KG-2 with Joe Koval and Norm Rosenstock. (Yes, we still sell the plans.) Photo by Frank Gudaitis.*

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

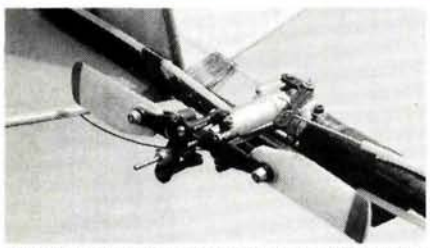
Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.**, 251 Danbury Rd., Wilton, CT 06897. Second-class postage paid at Wilton, CT, and at additional mailing offices. Subscription rates: $27.95 for 1 year (Canada, $43.82—includes G.S.T.; foreign, $40.95); $49.95 for 2 years (Canada, $81.27—includes G.S.T.; foreign, $75.95). **Postmaster:** send Form 3579 to **Model Airplane News**, P.O. Box 428, Mount Morris, IL 61054.

EDITORIAL

TOM ATWOOD

MODELING GENIUS

The models shown on this page reflect unusual and extraordinary forays into the world of model design. Behind such models are stories of imagination and fun, design challenge, and, in the end, technical and human triumph. If you are involved in a comparable project, we'd like to hear from you.

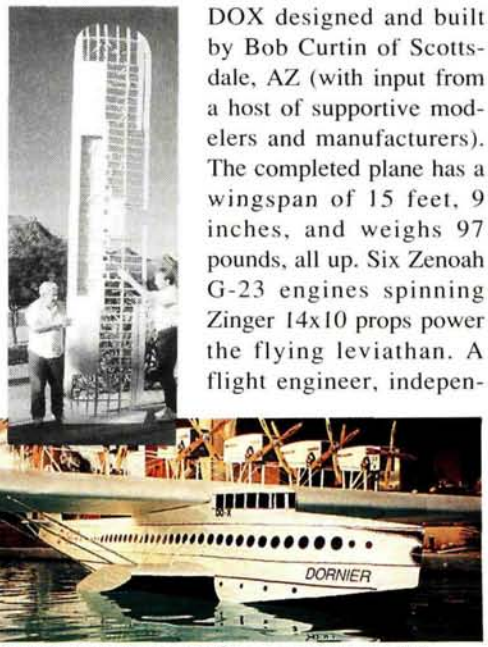


Top: the Scorpion proof-of-concept Freewing design; middle: Ed Hess's precision-scale Custer Channel Wing; bottom: another experimental foray by Russ Pribanic.

Consider the first: the Freewing tilt-body aircraft now under development by the Maryland-based Freewing Aerial Robotics Corp. (the photo, at upper left, shows an early proof-of-concept model—the 6-foot-span, Super Tigre .90-powered Scorpion, developed by Burt Rutan and Freewing Aircraft). The Scorpion is stall-resistant and able to fly at 20 percent of stall speed (see the editorial in our July '93 issue for more details). Another version is being developed with full hover capability. The design offers very stable flight because the wing pivots along its lengthwise axis in response to turbulence, absorbing energy that would otherwise be transmitted to the fuselage. The U.S. Small Business Administration recently listed the Freewing design as one of 86 important innovations by small U.S. firms in the 20th century (joining such inventions as the personal computer and solid-fuel rocket engine). The Freewing idea is old, but the applied technology is new—and now we have a third alternative to the fixed- and rotor-wing categories!

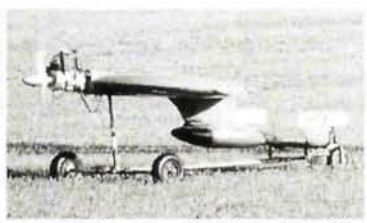
Sometimes, experimental designs and precision scale blend perfectly. We photographed the gorgeous Custer Channel Wing, built by Ed Hess of Las Vegas, NV, at the '92 Northwest Model Exposition (Puyallup, WA). The full-scale design showed promise, but we haven't heard how the model flew. (We'd love to hear from you, Ed!) The odd prop configuration shown separately is an example of the fertile imagination of contributing writer Russ Pribanic. A helicopter tail rotor, powered by a drive train connected directly to the crankshaft of a .32 2-stroke engine at the front of the airplane, was used to investigate just how fast and flat spins could be flown (they were impressive).

On a grander scale, and again in the precision-scale world, Marshall Sims and Matt Parsons hold up the framed-up wing of a 1/10-scale Dornier DOX designed and built by Bob Curtin of Scottsdale, AZ (with input from a host of supportive modelers and manufacturers). The completed plane has a wingspan of 15 feet, 9 inches, and weighs 97 pounds, all up. Six Zenoah G-23 engines spinning Zinger 14x10 props power the flying leviathan. A flight engineer, independent of the pilot, controls the engines with the aid of downlink telemetry.



Bob Curtin's 97-pound, 1/10-scale Dornier DOX.

At the bottom is a 42-inch-"ringspan" Starship Enterprise built by UAV designer Don Schaper of Madison, AL. It not only flies, it's also fully aerobatic. (He built it on a bet that it couldn't be done.) The all-fiberglass, Q-35-powered model weighs 14 pounds fueled (7 pounds of nose ballast), has 1,000 squares, a wing loading of about 65 ounces per square foot and uses a thicker airfoil outboard to prevent tip-stalling. It lifts off the gurney on takeoff. Would you like to see full-blown reports on such aircraft? What interesting scale or experimental design(s) are you or your friends perfecting? If you'd like to share the details, please write to me, c/o *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. You can also fax me at (203) 762-9803, or send e-mail to: toma@airage.com.



Don Schaper's fully aerobatic Starship Enterprise still harnessed to the releasable takeoff gurney.

(Continued on page 97)

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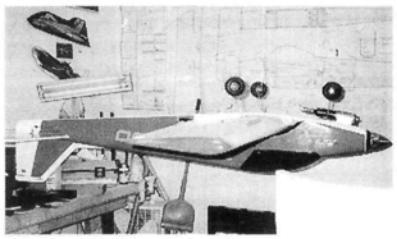
AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

Errata: in Andy Lennon's article "Ducted-Cowl Design, Part 2" in the September '94 issue, we mistakenly labeled the right-side column of the Table of ordinates in Figure 8. It should read $Y/\frac{W}{2}$ not $Y/\frac{W}{z}$ as published.

BALANCING ACT

I've read many articles on how to balance model airplanes, but none has suggested a method as easy or as true as mine. I don't use sticks under the wing or hang the model by strings at each end. A model airplane has one point of balance: where the wing's CG and the fuselage center line intersect.



When I build models, I install a light plywood block at this intersection. The block goes on the top for a high-wing design and on the bottom for a low-wing design. When I'm ready to balance the plane, I screw a small eyebolt into the block. I then make an S-hook out of 1/16-inch rod and hang the model from the eyebolt, as shown in the photo. With the model suspended, I can add weight to balance the model both front to back and side to side. I've found that models that have been balanced in this way require very little trim movement when they are flown. My new Ultra Sport 1000 is being balanced in the photo.

KEN HUMBERT
Mt. Clemens, MI

Ken, thanks for this innovative modeling tip. Your simple, effective idea should be of great help to many. Too many models meet an untimely end simply owing to an incorrect or inaccurately measured CG location. A bonus: with your built-in eyebolt mount block, you can store your models by hanging them in the rafters! GY

STARTING SCALE

I'm an intermediate builder and flier of R/C airplanes. I've built a glider, two ARFs (not much to build) and a Midwest Hots II. I'm currently flying my Hots with an O.S. .46 SF and am comfortable with it.

I went to the Scale Nationals in Mile Square Park, Fountain Valley, CA. There were many fantastic aircraft there, and the whole event was very impressive and well-run. I've always been fascinated with scale model planes and would very much like to participate in this aspect of our great hobby. I spoke with one of the judges, and he suggested that I start with a 1/4-scale Cub or a Spacewalker. I really like the looks of these models, but 1/4 scale is really expensive in the engine department. I definitely want to use a 4-stroke for power, but the biggest one I can afford is an ASP .80 or .91. Is a Goldberg Cub a good airplane to start flying scale with? Or would the 1/6-scale Sig Cub a better choice? I also love the lines of the 1/5-scale Pica Aeronca Sedan. I'd really value your opinion on this subject. I have a Futaba 7UAP radio and am ready (and excited) to hear your response.

JEFF CASSENS
Aliso Viejo, CA

Jeff, scale modeling has many positive things going for it; there's something to satisfy everyone. For builders, there's the satisfaction of gluing things together; historians will get much pleasure out of searching for and assembling all the scale documentation for his model; and the pilot in us all will be pleased when he perfects his flying skills and operates his model in a realistic, scale-like manner.

Scale meets/contests are a natural outlet for all this enthusiasm, and it's very easy to get started. One of the best places to start is in fun scale; the kit - box photo can serve as documentation, and the quality of a pilot's flying is stressed more than his building prowess.

To fly scale successfully, you need to build a model that matches your level of proficiency. The Goldberg Piper Cub (76.5-inch wingspan; 744 square inches; .40 to .61 2-stroke, .61 to .90 4-stroke) and Sig J-3 Piper Cub (71-inch wingspan; 700 square inches; .25 to .40 2-stroke, .40 to .45 4-stroke) are good first choices for anyone who has a few kits under his belt. The Sig kit is a bit small for an ASP 4-stroke .80, but the Goldberg would fly well with a lot of power to spare.

The Sig Cub, the earliest of the designs, has a fuselage framework made mostly of 1/4-inch-square balsa and a wing that has two center-rib one-piece spars in each wing panel. Built according to the instructions, the model is strong and light, and it can easily be dolled up for scale. With the addition of hinges, the side door can be made to open and close and, because the interior is clear of formers, you can install details such as seats, floorboards, rudder pedals, etc. The Goldberg Cub, on the other hand, can be built a little more quickly. Its wing has a double spar with shear webbing, and the landing gear is somewhat simpler to build (no soldering is required). The formed windows are easy to install and, like the Sig kit, the Goldberg kit produces a strong, easy-to-fly model. For more information on these kits, contact Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60651, (312) 626-9550; and Sig Mfg. Co., 401 S. Front St., Montezuma, IA 50171, (513) 623-5154.

Another kit to consider is the Piper J-3 Cub (76.5-inch wingspan; 820 square inches; .40 to .60 2-stroke, .48 to .80 4-stroke) recently introduced by Great Planes Model Distibutors Co., P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300. It also has a wing that's built with a double spar with shear webs. This kit is advertised as having "exact scale outline," but any of these kits would be fine for entry-level scale. I think that a slightly larger model—1/5 scale—would be ideal for the ASP .80 4-stroke engine. Ikon N'West—P.O. Box 306, Post Falls, ID 83854, (208) 773-9001—offers a few

(Continued on page 97)

CONSTRUCTION

Build this easy-flying, glow-powered glider

the Dove

by ANDY LENNON

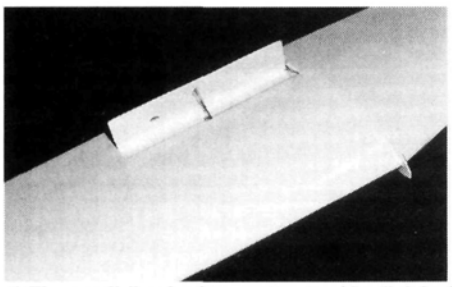
THE DOVE IS a hand-launched, glow-powered glider. Its design objectives were to have a stable, sturdy model for relaxed, easy-to-fly fun, and they were achieved.

PERFORMANCE

The glide—power-off—is very good despite the non-folding prop; the climb—under full power—is quite brisk, considering the model's high power loading. This is attributable to the model's low drag and to the wing's aspect ratio of 10.

On reaching soaring altitude, the pilot has three options:

- Trim for level flight at full power.
- Trim for level flight at reduced rpm and go thermal hunting. It maintains altitude at surprisingly low rpm.
- Stop the engine and glide. With a slow rate of descent and judicious use of the spoil flaps, dead-stick landings are easy.

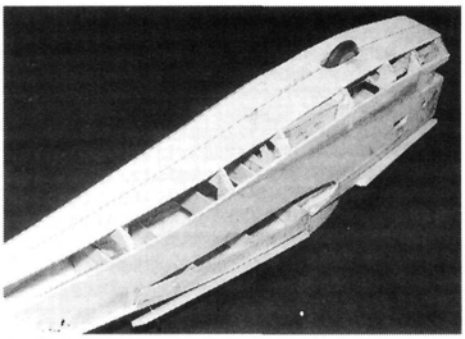


1. The spoil flap is shown raised on the finished wing.

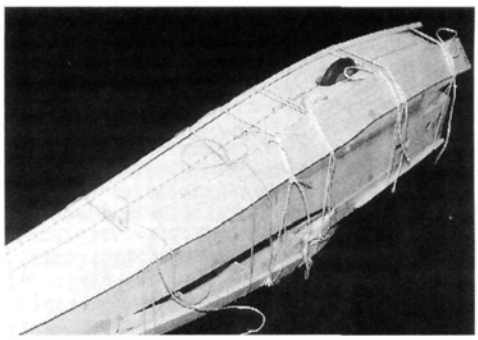
SPOIL FLAPS

These are an innovation for model airplanes, and they are pure fun to use. The spoil flaps are located on the wing's trailing edge, well away from the fuselage (photo 1). The turbulence they create when extended passes below and beyond the span of the horizontal T-tail. Extending them at any speed, does not change the model's *attitude;* it neither noses up nor down, but continues on its merry way, flying noticeably more slowly and with a greater sink rate. This has two major uses:

- To lose altitude quickly: throttle back, extend the spoil flaps and nose the Dove into a steep, almost vertical glide. The high flap drag prevents the aircraft from accelerating. The terminal velocity is low.
- On landing, judicious use of the spoil flaps controls the descent and results in short-field, no-float landings under good control. Under full power, the model will climb well, spoil flaps extended.

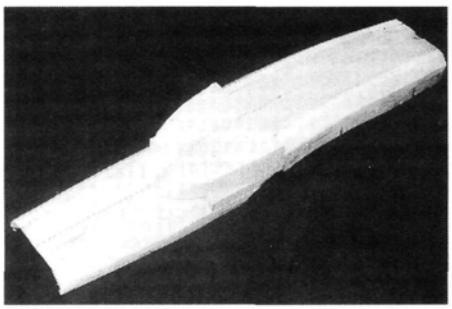


2. The partially assembled fuselage.



3. Installing the fuselage corner strips.

PHOTOS BY ANDY LENNON



4. Canopy assembly.

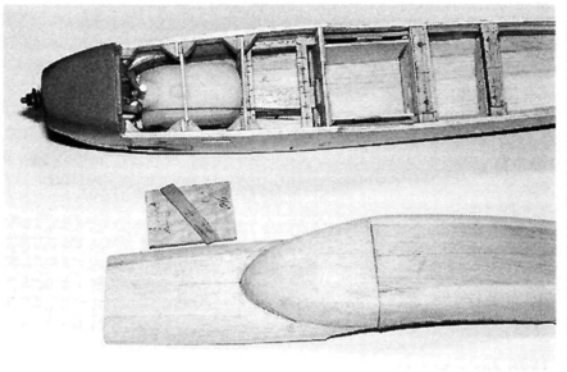
CONTROLS

These consist of elevator, rudder, throttle and spoil flaps. Plugging the rudder servo into the receiver's aileron channel provides both rudder and elevator control on one control stick. Throttle control is on the second stick. Normal rudder control is not used. For the spoil flap, a retract channel provides full-down or full-up positions; use of an auxiliary channel—either three-position or proportional—permits an intermediate position of the spoil flaps.

The engine should be stopped on short final to avoid damaging the propeller. The carburetor, engine servo and the linkage between them should be adjusted so that when the throttle stick and trim lever are both "down," the carburetor is fully closed and the engine stops immediately. Also, the prop is positioned on the prop shaft so that, with the engine stopped, it will windmill to a horizontal position against engine compression, out of harm's way.

ENGINE AND MUFFLER

My O.S.* Max .15 RC is an older version. The muffler is Tatone's* "3-way" for .09



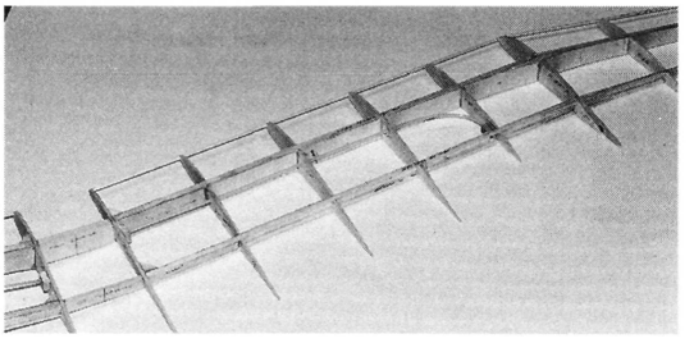
5. Top: the fuselage and canopy with the engine and cowl installed. Note the ball-check valve above the engine control cable. 6. Right: wing assembly fixture. The base is pressed-wood shelving to which the drawings have been lightly rubber-cemented. The ¼-inch-square balsa strips are under the spars.

to .19 engines. This engine has a small hole drilled at each end of the exhaust opening. Tapping these holes 2-56 and drilling mating holes in the muffler (0.0935-inch-diameter; drill bit no. 42) permits the muffler to be bolted directly to the cylinder with 2-56 socket-head screws for a solid, vibration-proof assembly (with split lock washers under the screw heads).

Newer versions of the O.S. Max .15 have lugs cast on the cylinder for a similar assembly, as do many other makes of .15 engines.

The muffler comes with three exhaust stacks that are not cored through the muffler walls. Select the stack that points *downward* when the muffler is positioned on the *inverted* engine, and remove the other two stacks. Drill through the muffler wall at the bottom of the hole in the remaining stack (¼-inch diameter), and insert a short length of ¼-inch-o.d. aluminum tube to serve as a stack extension. Drill a 1/16-inch-diameter hole through the stack wall and extension tube and insert a tiny, self-tapping screw in the hole to retain the extension in the stack.

Plug the tapped holes in the muffler (intended for use with the "around-the-cylinder" clamp) with the small screws supplied with the muffler.



7. The un-sheeted wing sub-assembly. The spoil-flap cable sheaths are visible.

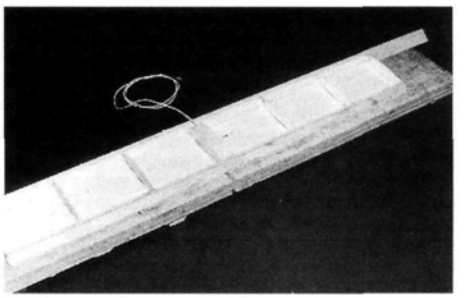
Launch the Dove with the engine in a slightly rich 2-stroke. As the fuel level lowers, it will lean out but will not quit. The 4-ounce tank is large for a .15 engine, but it permits 20- to 25-minute engine runs.

ANTENNA

To reduce drag, improve appearance and protect it from being damaged, the antenna is built into the Dove's structure. It runs in 3/16-inch-o.d. plastic tubing from the receiver, down the fuselage and to the fin top, and continues into the stabilizer. The antenna must be disconnected from the receiver to permit this installation. A small coupling is installed in the antenna about 3 inches from the receiver. These couplings come from Radio Shack, nine-position, solder-type gang connectors (no. 276-1537 male and no. 276-1538 female). Dismantling one of these will provide nine connectors.

Installing these connectors requires several actions:

- Carefully measure and record the antenna's length.
- Cut the antenna 3 inches from the receiver.
- Solder the male portion of the connector to the stub, and the female part to the antenna.
- Protect the soldered joints with heat-shrink tubing.
- Connect the male and female portions, and trim the far end of the antenna to its original length. This permits the receiver to be moved easily and quickly to other models with similar antenna installations.



8. Stabilizer assembly. Note the antenna in position and the block-balsa center rib.

STRUCTURE

This model's structure is based on stressed-skin principles as outlined in *Model Airplane News* September and October '92 issues. It's fully sheet-balsa skinned with a plastic film overlay—either MonoKote* or Ultracote*—which also provide the hinges (see plan sheet 2).

Before the first test flights, the spoil flap and related wing structure were modified to that shown on plan sheet 2 of the Dove's drawings for improved fit and action. Photo 1 shows the original design.

Dove Weight Analysis

The following tabulation compares actual to estimated weights, for anyone interested in design. For once, the actual is less than the estimated weight, owing largely to the wing's low weight.

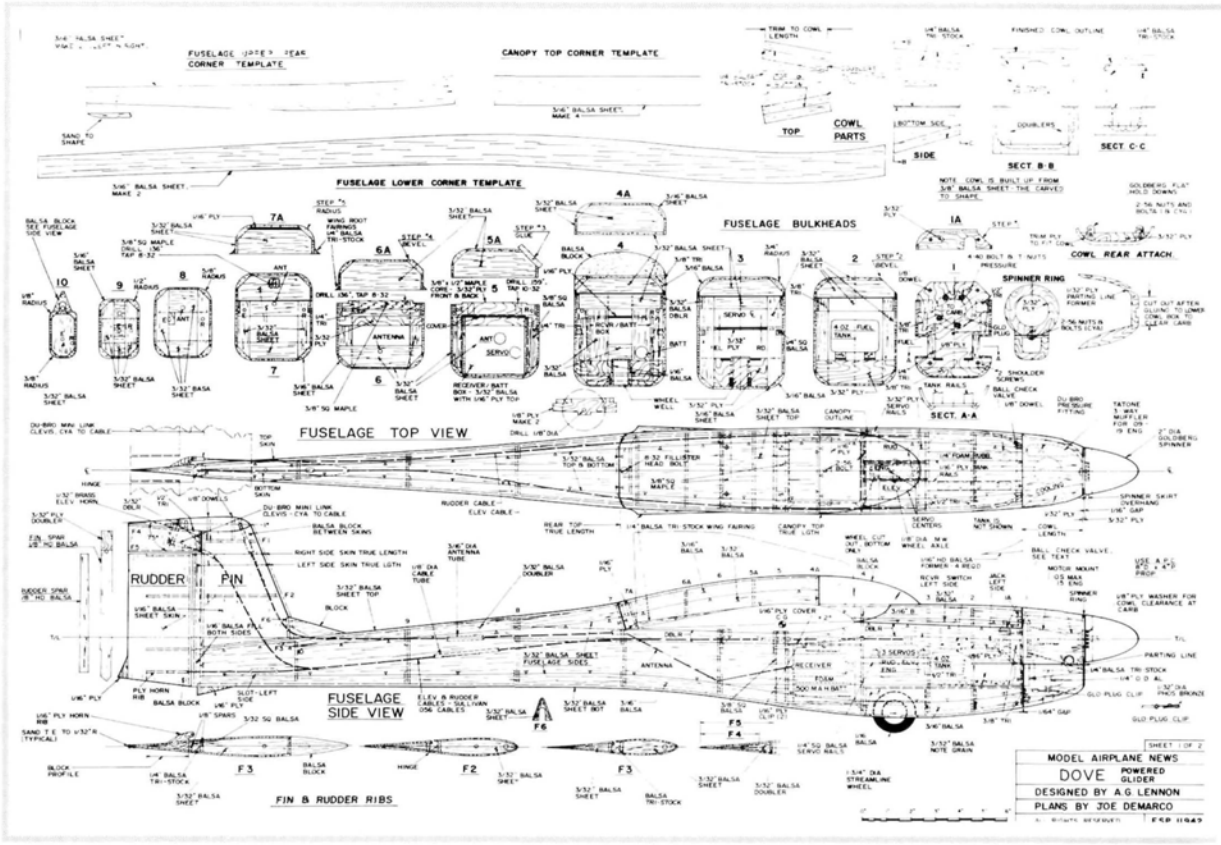
	WEIGHT Actual (oz.)	Estimate (oz.)
Fuselage, power unit, and vertical tail	24.750	25.25
Horizontal T-tail	2.625	2.00
Wing	13.250	18.00
Control unit*: four S148 servos; receiver; and 500mAh battery (*used heavier 8-channel receiver)	12.750	12.00
Fuel	2.00	2.00
TOTALS	**55.375**	**59.25**

Gross weight per square inch of wing area: 0.092 oz.

ENGINE STARTING AND THE BALL-CHECK VALVE

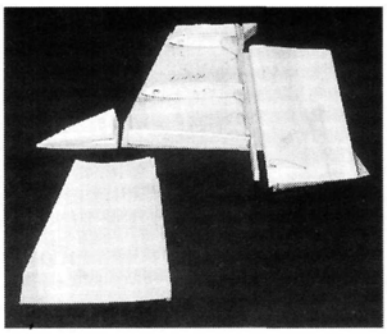
Inverting the model on your field box brings the engine to an upright position for easy starting. In this position, fuel could run from the tank into the muffler via the muffler pressure tubing. A ball-check valve installed in that tubing prevents this

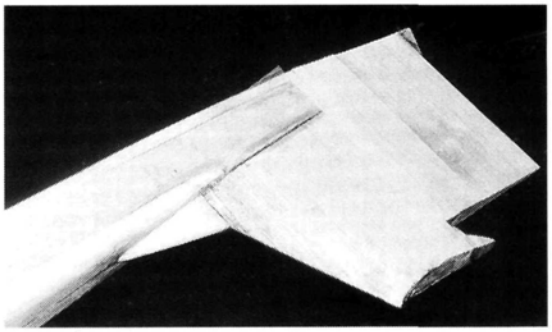
potentially dangerous situation. This valve is simply a two-piece, aluminum, in-line fuel filter (the smallest you can find) with a 5⁄32-inch-diameter ball bearing installed inside. The ball-check valve is positioned vertically (see plan sheet 1) so that when the model is upright, the ball rests on the filter's screen. Inverting the model causes the ball to fall, by gravity, into the unscreened portion of the filter, effectively preventing fuel from flowing from the tank into the muffler. When the engine starts, muffler pressure and carburetor suction in the tank combine to lift the ball and permit air to enter the tank as the fuel is sucked out.



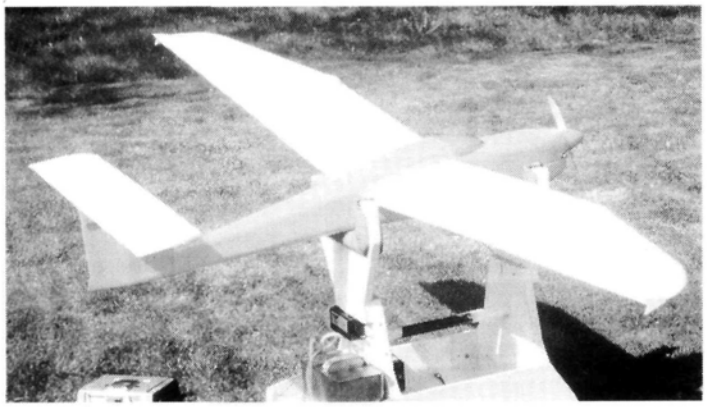
SPECIFICATIONS

Type: sport powered glider
Wingspan: 78 in.
Wing area: 602 sq. in. (4.18 sq. ft.)
Wing aspect ratio: 10
Chords: root—9 in.; tip—5.37 in.
Airfoils: wing—Eppler 197; tail—Eppler 168
Length: 42.25 in. overall
Horizontal T-tail: span—23 in.; chord—5 in.; area—108 sq. in.
Engine: O.S. Max .15
Prop: APC* 8x4
Fuel Tank: 4-oz., slant-front Sullivan*
Muffler: Tatone* "3-way" for .09 to .19 engines
Landing gear: single, 1¾-in.-diameter wheel
Controls: elevator, rudder, engine, spoil flaps
Gross weight: 55 oz.
Loading: wing—13.16 oz./sq. ft.; power—367 oz./cid
Radio: Futaba 4-channel with retracts





9. Left: fin and rudder assembly. Note the balsa-block top rib. 10. Right: the fin and rudder installed on the fuselage.



The Dove at rest. Note the wing design and placement of the horizontal T-tail.

CONSTRUCTION

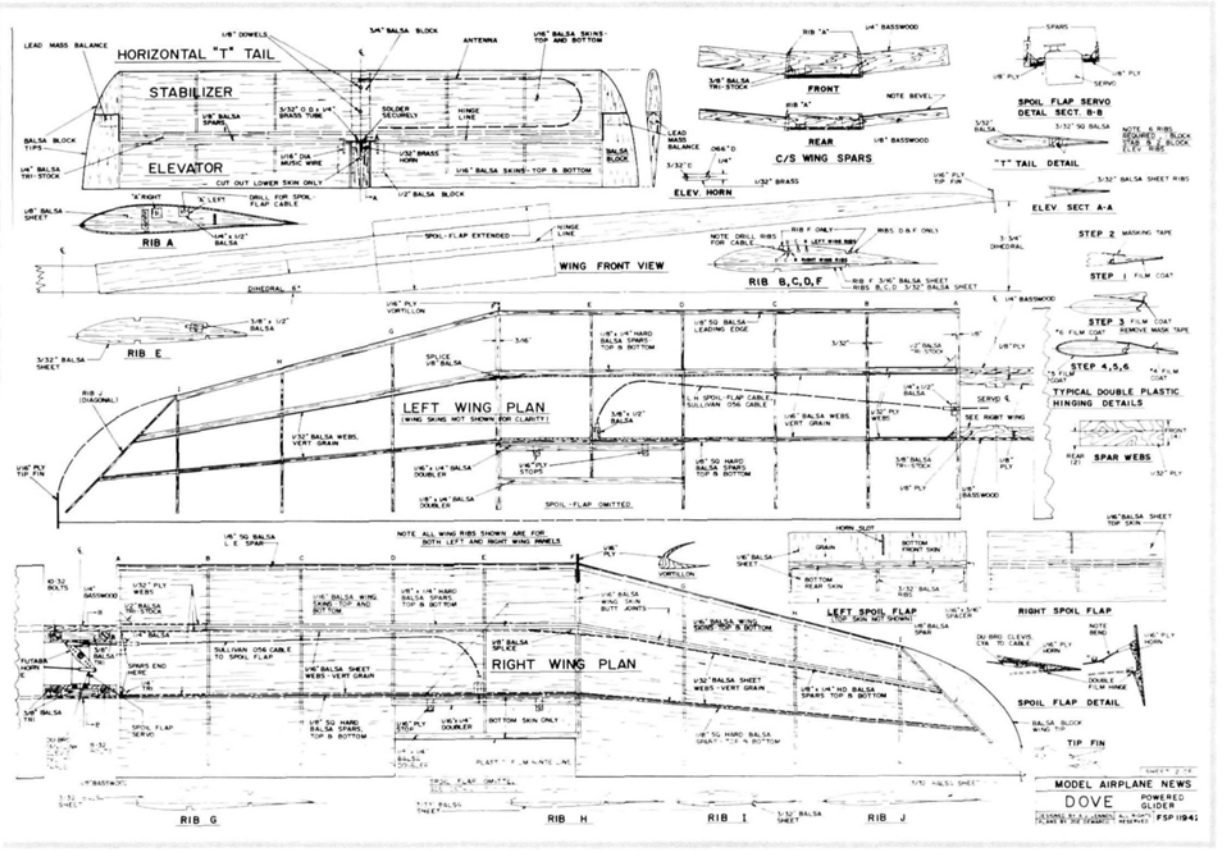
The Dove's drawings have been carefully detailed. Together with the construction photos, there should be few problems in making all the components. Having "kitted" the model, there follows a series of sub-assemblies that lead to the final assembly. The photos and captions illustrate this procedure.

• **Fuselage.** Photos 2 through 5 show the fuselage construction. In applying the corner strips, follow the five-step procedure illustrated in the drawings (plan sheet 1) to round these corners.

• **Wing.** Photos 6 and 7 illustrate the wing assembly. Do not install the ⅛-inch-thick ply hold-down pieces until both the fuselage and the wing have been completed. Bolt them to the fuselage at bulkheads 5 and 6, then install and carefully align the wing on the fuselage. Lightly tack-glue the ply hold-downs to the wing spars and ribs—left and right. Unbolt the wing from the fuselage and add glue and the tri-stock reinforcements. The servo installation for the spoil flap follows.

• **Horizontal and vertical tails.** Photos 8 through 11 show the assembly of these components. Note in photo 8 that the antenna must be installed in the stab before adding the second skin.

• **Cowl.** Photos 12, 13 and 14 illustrate the cowl assembly. Note also the "cowl box"



CONCLUSION

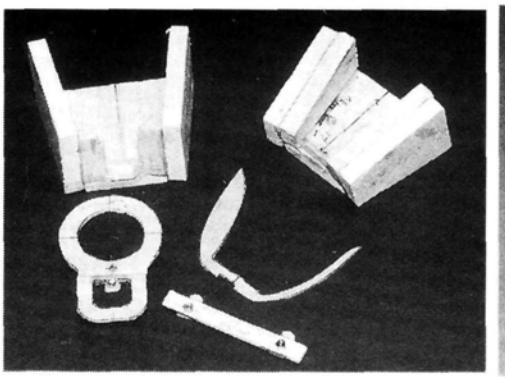
The striking difference in the Dove's performance between the flap-retracted and flap-extended conditions clearly illustrates the impact that unnecessary drag can have on an aircraft's behavior. This author "preaches" drag reduction (see *Model Airplane News*, January, February and March '92) for both improved performances and appearances.

The Dove was designed for relaxed, enjoyable flight and

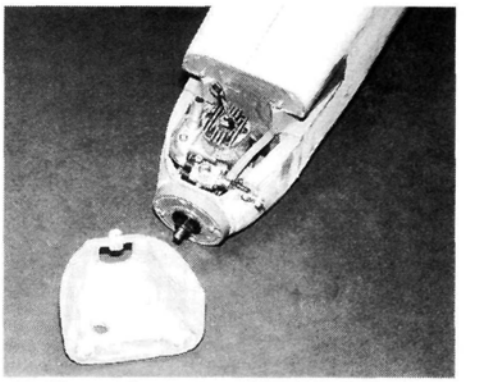
The striking difference in the Dove's performance between the flap-retracted and flap-extended conditions clearly illustrates the impact that unnecessary drag can have on an aircraft's behavior.

shown on sheet 1 of the plan. The articles "Ducted Cowl Design," Parts 1 and 2, in the August and September '94 issues of *Model Airplane News* provide further information.

• **Controls.** The linkages between the servos and the control surfaces are Sullivan* 0.056-inch-diameter cable running in plastic tubing. Du-Bro* mini-link clevises are CA'd onto the rudder, elevator and carb cables and to both ends of the spoil-flaps cables. At the rudder and elevator servos, the cables are CA'd into threaded couplers that are screwed into the mini-links. This arrangement permits the rudder and elevator neutral positions to be adjusted. A Du-Bro EZ connector attaches the cable to the engine servo.



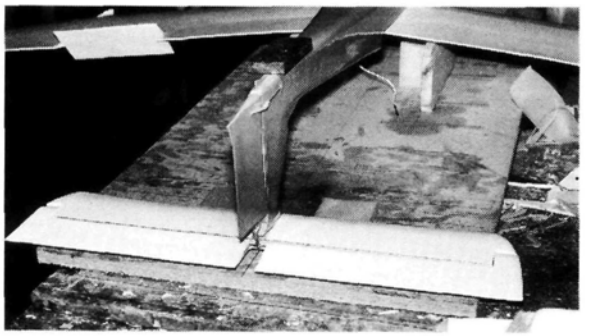
12. Cowl component sub-assemblies.



13. The engine and muffler installation. The cooling outlets show clearly.

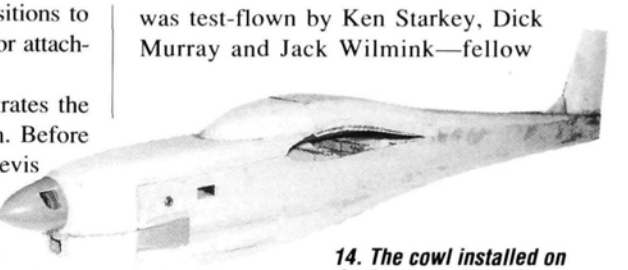
• **T-tail assembly.** Photo 11 illustrates the installation of the T-tail on the fin. Before epoxying this joint, the elevator clevis must be attached to the elevator horn, and the antenna must be run down the plastic tubing in the fin and fuselage to be connected with the receiver. Do not omit the ⅛-inch-diameter dowels. The "T" assembly between the elevator inboard ends and above the rudder will complete this final assembly.

• **Painting and covering.** The Dove was covered in Ultracote*. The cowl, wing and horizontal T-tail block tips were painted.



11. The fixture for the final assembly of the horizontal T-tail atop the fin.

was test-flown by Ken Starkey, Dick Murray and Jack Wilmink—fellow



14. The cowl installed on the fuselage. Note the glow-plug energizing jack.

club members and expert pilots—with my thanks. They enjoyed its performance and the versatility provided by the spoil flaps. The Dove is capable of the mild aerobatics permitted by rudder- and elevator-only controls. Enjoy!

**Addresses are listed alphabetically in the Index of Manufacturers on page 121.* ■

AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

The Luck of the Draw

The 1994 Reno R/C Air Races were held at Stead Airport, June 1 through 5. The number of contestants nearly doubled from last year—a testament to the incredible growth the sport has enjoyed since the first giant-scale race was held in 1991.

Struggling to remain on the 475-foot-wide course, the Unlimited pilots treated the crowd to some of the most exciting racing ever. For the first time in the history of the sport, a Corsair led the pack throughout the five-day event. It was only a few laps away from the championship before it was abruptly taken out of the race by a midair with another racer.

280cc Herbranson twin.

Two things ensured the success of the Corsair: Scott Manning's superb flying and the awesome horsepower of its 280cc Herbranson twin. Scott whipped the 46-pound Corsair around the pylons in a dazzling display of speed and power.

With the Corsair and Dan Gray's Stiletto out, the field was left to three aircraft: a Stiletto flown by Dave Smith, a Lancair IV flown by Rick Maida and a Vendetta flown by Rodger Grotheer. The Stiletto and the Lancair quickly locked horns in a pitched battle for first, with the Stiletto finally driving ahead to win it—perhaps finally laying to rest any fears that the Lancair would dominate the races for '94.

A full field of AT-6 Texans battled it out in typically close heats throughout the week, with the top five slugging it out for the Gold on Sunday. To no one's surprise, Fred Burgdorf equalled his 1994 Galveston victory by taking first, with Aerosport's Kelly Carter right on his heels and Dennis Crooks close behind.

Next year will see a change in sites, so watch these pages for details.

—Rob Wood

Scott Manning's 280cc Herbranson twin-powered Corsair proved you don't need a Lancair or Stiletto to lead the pack in Unlimited racing.

Reno '94 Race Results

Unlimited Gold

Pos.	Team/pilot	Race no.	Aircraft/kit	Wt. (wet lb.)	Engine	Prize
1	RWR/Dave Smith	99	Stiletto/Sky Aviation	46	Aerrow 200	$2,400
2	Aerrow Sports/Rick Maida	1	Lancair IV/scratch	40	Aerrow 200	$1,600
3	R/C Country/Rodger Grotheer	4	Vendetta/Horndog	33	3W 120	$1,520

Unlimited Silver

1	Canadian/Frank McCrindle	7	Strega/Sky Aviation	54	Aerrow 200	$1,424
2	4-Stroke/Diego Lopez	3	Strega/K.T. Aviation	39	Van Leeuwen 4-stroke	$1,120
3	Teamamerica/Dan Egelhoff	97	Dago Red/Nosen	36.5	Aerrow 100	$1,088

Unlimited Bronze

1	Excaliber/Harold Dew	111	Stiletto/Saxton	34	Quadra 100	$2,880

Only one aircraft competed.

AT-6 Gold

Pos.	Team/pilot	Race no.	Kit	Wt. (wet/lb.)	Prize
1	Race Pro/Fred Burgdorf	75	Race Pro	25	$1,150
2	Aerosport/Kelly Carter	11	Aerosport	28.8	$747
3	Crooks/Dennis Crooks	140	Bridi	25	$709

AT-6 Silver

1	Ultimate/Kendall Knowles	91	Scratch	30	$665
2	River City/Barry Woolstenhulme	30	Chuck Gill	32	$523
3	Douglas/Mac Douglas	600	Byron	25.5	$508

AT-6 Bronze

1	Miller/Krohn/Mike Helsel	15	Scratch	27	$448
2	Webster/Weldon Dolgoff	123	Byron	26.5	$336
3	Little City/Steve Rechenmacher	22	Byron	27	$224

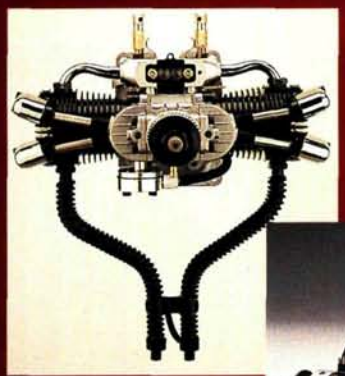
*Note: all fuel provided, all engines Zenoah G-62s, all props Zinger 22x10s (provided).

Dave Smith's Stiletto.

Rick Maida's Lancair.

PHOTOS BY ROB WOOD

3 YEARS! UNPRECEDENTED PROTECTION



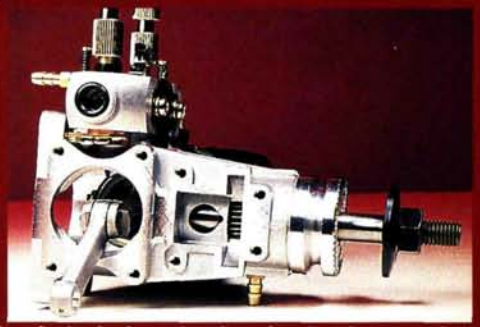
Far left: FA-100T left: FA-80 Golden Knight

OVER THE last seven or eight years, with intense R&D, Saito has so improved its line in terms of power and reliability that its products have become favorites among scale and sport modelers—me included. I obtained an .80 when they first became available years ago, and I was very impressed with its power and amazed by its reliability. After six flying seasons, I can count on one hand the dead-sticks I've had with this engine. It's so reliable that it's often my first pick for a floatplane project. (I like swimming on *my* terms!)

While creating a high level of user satisfaction, this fine line of 4-stroke engines has bred something else—manufacturer confidence; so much so that all Saito engines purchased as of August 1, 1994, will be covered by the new warranty, which reads: "Saito, Seisakusho, Ltd. warrants this 4-cycle engine product against defects in materials and workmanship for a period of THREE (3) YEARS from the date of original purchase. During this period, Horizon Service Center will repair or replace, at no charge, any Saito product that proves to be defective during the warranty period...." This is *unprecedented* in the 4-stroke model engine market.

One feature that gives Saito the confidence to offer this warranty is the engine's one-piece head-and-cylinder construction. There seems to be some misconceptions about this type of construction. Some are under the impression this is done to cut costs. The fact is, the machining involved with this type of construction is more complex and more expensive. Does the name Offenhauser mean anything to you? The legendary Offenhauser racing engine put out a tremendous amount of horsepower for its displacement and was also constructed in this manner. Saito head/cylinder assemblies look rather simplistic from the outside, but when viewed from the inside, it's clear that they're at the leading edge of technology. Not only does the one-piece technology offer greater strength, compression seal and warp resistance, but the brass liner (with those engines that employ them) are also placed *inside* the mold, and the head/cylinder is cast around it. I know of no other manufacturers who's doing this. This, combined with the one-piece construction, has to give fantastic heat transfer for superior cooling.

When one looks in the hemispherical combustion chamber, two things are obvious: large valves (another benefit of the one-piece, no-head-bolts construction; it's for more performance) and a rough combustion surface.



Left: Large valves and rough-surface hemispherical combustion chamber boost performance and increase reliability. Right: FA-100T crankcase with right cylinder and cam-drive housing removed. The quality workmanship is apparent.

Saito claims that the rough surface, like the glass-beaded surface of intake ports on high-performance engines, aids fuel/air mixture atomization for more even combustion. The way my Saito engine idles, I believe it.

Maybe you think I'm making too much of this, but this is a program that warrants support—one that could truly benefit the modeler, and we deserve it! Moreover, I, and many of my flying buddies, have had great success with Saito products. The company has worked hard on them; I think they deserve recognition.

Right: Simplisticly clean outside appearance of this Saito cylinder/head assembly belies the inside story. Far right: Chromed brass sleeve, cylinder and head are cast as one piece. Unit is ultra-ridged, leak-proof and possesses excellent cooling characteristics (see text).

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1994. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

SCRATCH-BUILT ZIROLI B25-J

Sixty-three-year-old Bob Vernum from Alameda, CA, sent us this photo of his scratch-built Ziroli B25-J. Built over seven months, the bomber is powered by two Saito 150S engines. Bob, a retired technical director at CBS TV, controls his B25-J using a Futaba FM system. The plane was awarded Pilots' Choice award at the June '94 4-Stroke Scale Squadron meet in Woodland, CA.

LONGTIME READER AND FLIER

Andy Ochse of Morningside, South Africa, has been building model planes since 1945 and has been reading *Model Airplane News* since 1952. The yellow and red stick-type plane is Andy's interpretation of a Sunday flier, and it's powered by a .46-size engine. The scratch-built craft has a wingspan of 50 inches and, in its owner's words, "is fast and groovy with no bad habits." The red, white and blue plane is based on an old EZ Pinto, and it has a 48-inch wingspan and an O.S. .25 F engine. →

SCALE SPITFIRE

Eight-year old Alex Luchun holds his dad Bob's Dynaflite fun-scale Spitfire. The Luchuns hail from Millville, PA, and they tell us that their plane is powered by a Royal .40 engine, has Hobbico retracts and is covered with MonoKote and painted with Pactra's Formula-U. Dad Bob controls the plane using a Hitec 6-channel radio; young Alex is still in training!

AMA No. 958

← E.C. "Jack" Mullikin of Brooksville, FL, has been building and flying R/C planes ever since he stopped flying full-size ones about 35 years ago. Powered by an ASP .75 engine, his Corsair has a full cockpit with instruments, a mahogany dashboard and a detailed pilot figure. He even added such scale touches as an arresting hook on the rear, and he made the four-blade prop himself. If Jack's model looks authentic, it should; he taught pilots how to fly Corsairs during WW II.

THE ULTIMATE SUKHOI? →

Mark Bail of Des Plaines, IL, sent us this photo and asked us to "Guess what it is." Here's the story: the fuselage is from a Carl Goldberg Sukhoi, and the wings are from an Ohio RC Ultimate biplane kit. An O.S. 1.08ci engine moves the 13-pound plane with authority, and black and red Super MonoKote gives the bipe the custom touch. Mark's trusty dog, Aileron, ensures that unauthorized hands never touch his beloved plane!

PILOT PROJECTS

RESNICK'S PUSHER

It took 15-year-old Joshua Resnick of Baldwinsville, NY, just nine months to complete this 1/5-scale, modified, Cressline Long-EZ. He says that he custom-built 90 percent of the kit's parts to fit his design specs. The EZ was entirely fiberglassed with Z-Poxy finishing resin, after which it was finished with 21st Century paints. Other features include retractable front landing gear and a scale air brake. Power for this pusher comes from an O.S. .61 with a Perry regulator pump.

SCHROEDER'S PIEDMONT DC-3

This Royal C-47 kit has been detailed to look just like a vintage Piedmont Airlines DC-3 (shown in the background). The model's creator, Pete Schroeder of Winston-Salem, NC, is a USAir F-100 first officer (although he used to fly for Piedmont). The model features an 83-inch wingspan and is powered by two Royal .46 engines. He added custom, retractable landing gear and functioning flaps, and he says that the Piedmont markings used on the model were taken from an original '67 flight schedule.

BIG, BEAUTIFUL DOLL

This 1/5-scale Pica P51-D is based on the Colonel J.D. Landers "Big Beautiful Doll." Jake Bruckler of Grass Valley, CA, tells us that this is his first scale project, and it took 1½ years to complete. The P51-D is powered by an O.S. BGX 3500 and features special custom touches, such as an operational canopy, sequenced landing-gear doors and drafting-tape panel lines. Jake used chalk pastels to create gun and engine weathering.

THE SIAMESE SCAT CAT

At one time, Douglas Ellis Jr. of Las Vegas, NV, owned two Scat Cat 500s. He merged the two planes into this twin-boom, twin-engine plane, affectionately known as the "Siamese Cat." The Cat is powered by two SuperTigre .40s, and, according to Douglas, the plane "goes from here to there in a big hurry, and it handles real sweet—even on one motor!" Douglas is a member of the Prop Nuts flying club in Las Vegas.

SPORTSTER SPEEDSTER!

This modified Great Planes Super Sportster 90-120 is the handiwork of Clint Veal of Salem, OR. The plane is powered by an O.S. 108 engine and is controlled by a Futaba Conquest 6-channel radio. To improve performance, Clint widened the ailerons by ¾ inch, added a ¼-scale servo to control them and moved the Sportster's canopy 6 inches rearward. He also had to add 8 ounces of lead to the plane's tail to balance out the heavy engine.

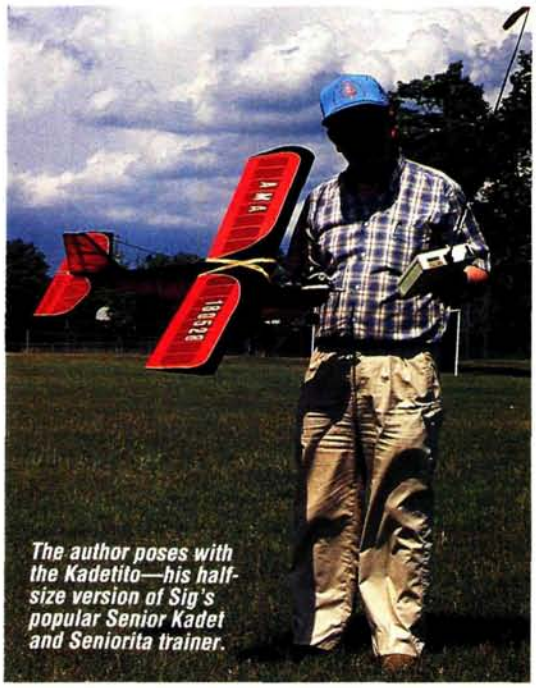
"RIVETING" F-86F

Having built two Bob Violett F-86F kits, Dick Rotkosky of Austin, TX, wanted something a little larger. The plane you see here is the result: it's scratch-built and approximately 24 percent larger than the Violett kit (wingspan—71.8 inches; length—72.6 inches). Dick had to make plugs and molds for all the plane's fiberglass parts. Power for the F-86F comes from a Viojett .91R. Features include operational speed brakes, wheel brakes and a navigation-light system. Oh, and don't forget 60,000 or so rivets! (See "Sporty Scale" in this issue and in the August '94 issue for more on this plane.)

Build the littlest Kadet—a half-size, budget trainer

by ALEX D. McLEOD

KADETITO

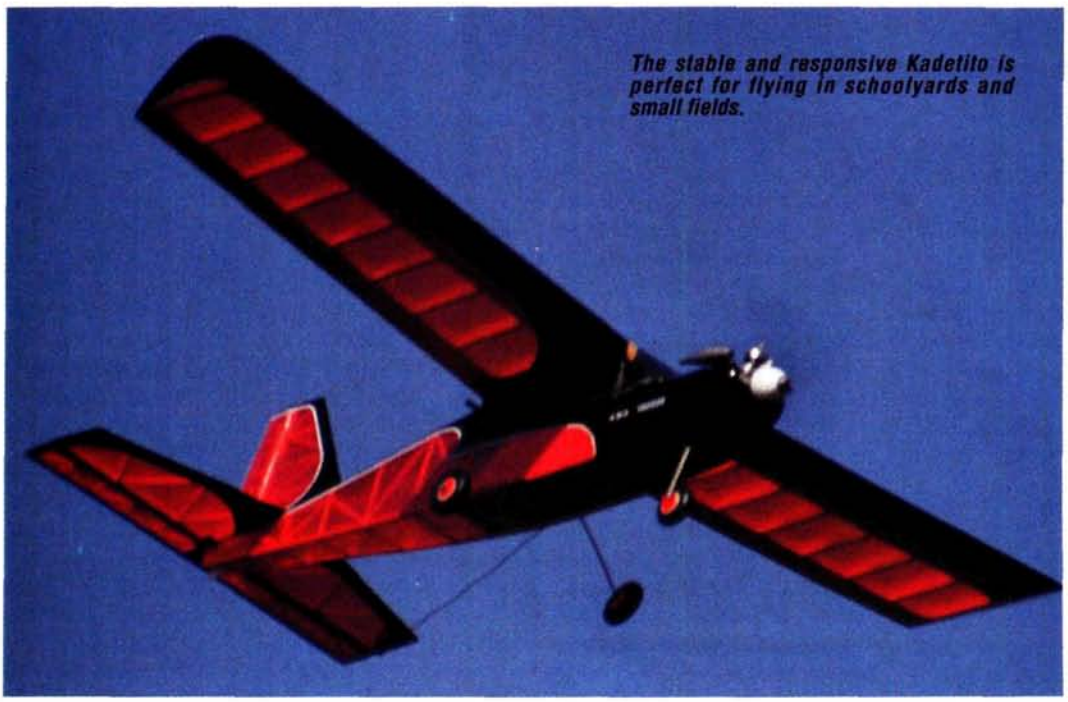


PHOTOS BY ALEX D. McLEOD

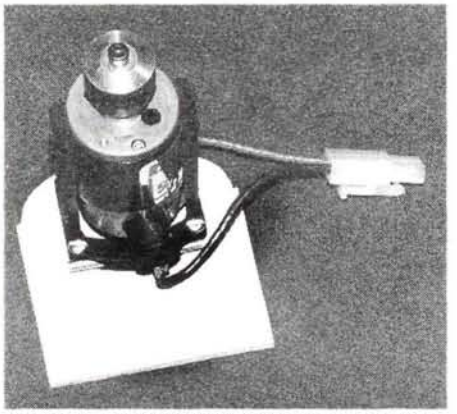
The author poses with the Kadetito—his half-size version of Sig's popular Senior Kadet and Seniorita trainer.

CONSTRUCTION

SIG'S* SENIOR KADET and Seniorita are among the best-behaved trainers I've ever flown because of their slow speed and forgiving ways. Their lightness is one of the major factors contributing to this. Light models will withstand many horrendous landings with little or no damage, so it is well worth the effort to construct a built-up type of structure; besides, they look pretty with transparent or semi-transparent covering. Here's a ½A-size, 39-inch-wingspan version of the famous Senior Kadet trainer that, if light enough, will fly well on a Golden Bee .049; if heavy enough, up to an .09. My model fell between and is powered by a G-Mark .061, which has a muffler and throttle. This gives it a better throttle response than most ½A engines that have only an exhaust sleeve. A Cox* .074 Queen Bee would be an excellent choice, too.



The stable and responsive Kadetito is perfect for flying in schoolyards and small fields.



The Astro Flight Cobalt .035 on a Tatone* 05 mount, fastened to former 1.*

Mike Gretz, and the other designers at Sig, thought it was cute and gave their blessing to this article. The original Senior Kadet and the Seniorita were hanging up in Sig's model workshop when I visited them with my "Kadetito." I was pleased with the similarities among all three.

SMALL DOESN'T ALWAYS MEAN "DARTY"

All too often, modelers have been heard to say that little models fly too fast or "dart around." Some do, because they're relatively heavy and must fly fast to remain in the air. The Kadetito does not give the illusion of flying fast or being an angry little mosquito darting about. Its lightness and 2 square feet of wing area give it the same characteristics as its big brother and sister. It's "plane" fun in a schoolyard and can be kept quite close when flying in confined spaces.

SPECIFICATIONS
Type: ½A sport
Wingspan: 39 in.
Length: 31 in.
Weight: 23 oz. glow; 29 oz. electric
Wing area: 300 sq. in.
Wing loading: 11 oz. per sq. ft.
Power req'd: .049 to .09
No. of channels req'd: 2 or 3 (rudder, elevator and throttle)

POWERPLANT VERSATILITY

I like flying electric models as well as glow-powered ones, so I provided for this when I built the Kadetito. Using a Du-Bro* .05 electric motor mount, it can be converted quite quickly to a Cobalt .035 with five 450mAh SCR cells. The electric version weighs 6 ounces more. Naturally, the weight would increase even further if larger cells were used. Rudder, elevator and on/off switch activated by the throttle servo are quite sufficient for flying in downtown schoolyards. No one ever notices the electric-powered model, and it flies just great. Six ounces do make a slight difference though. The model could be built lighter than the 23-ounce glow version by using heat-shrink plastic covering, lighter wood, not sheeting the wings, etc. I like the model so well that I'm planning a 48-inch version for a .10 to .15 engine.

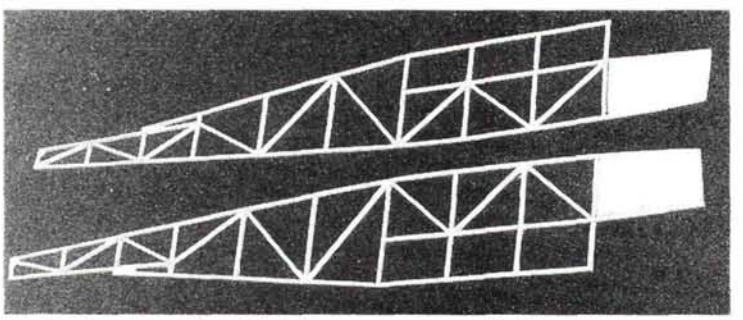
The G-Mark .061 engine on a Hayes mount, fastened to former 1.*

CONSTRUCTION

The Kadetito is built out of balsa and a little plywood. The less sheet and ply used, the better the model will fly. If you wish to cut out some of the fuselage and wing sheeting and shave down the ply parts, I'm sure it would help. There is a compromise between strength and weight though, so it's up to you.

FUSELAGE

Some people like to start with the easiest part, such as the tail assembly, but I always start with the fuselage, because it's the core of the model. Build the two fuselage sides over the plan out of ⅛-square hard balsa. I used spruce for the longerons; they're a little heavy, but strong. The ⅛-inch-thick balsa



The two fuselage sides of ⅛-inch-square spruce and balsa.

Cox Tee Dee .09 R/C Engine

Wow! This was my first word after flying the Kadetito with the new Tee Dee .09 R/C by Cox.

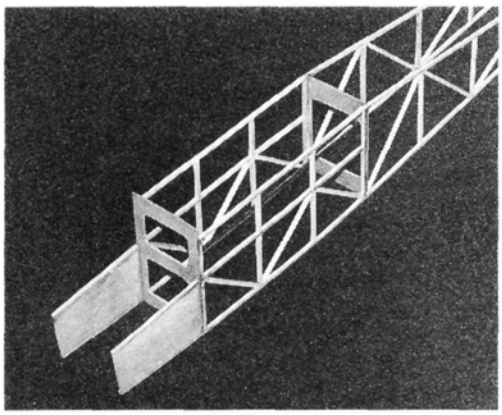
I was quite pleased when Tom Atwood said he had a new .09 engine by Cox for me to try in the Kadetito. Up to then, it had many pleasurable miles on it with a trusty G-Mark .06, and I had fun, but the Tee Dee .09 R/C makes it a little package of dynamite that will climb 200 feet straight up without hesitation and do any maneuvers a plane with rudder, elevator and throttle can (perhaps one with ailerons, too!).

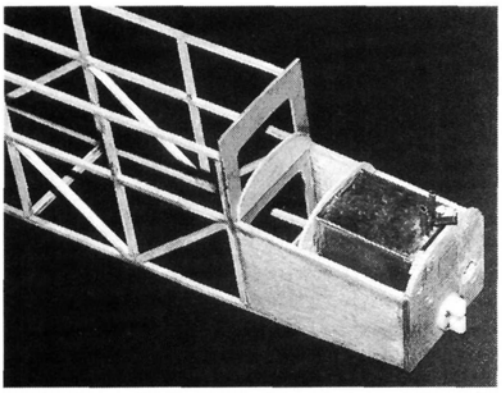
If gentle, relaxed flying is needed, the .09 will throttle back extremely well , and you can shoot touch-and-go's on a baseball diamond all day with it.

After I had run two tanks of fuel through the .09 (Cox ½A fuel is recommended), it was ready to fly. The beam mounts made it easy to use the same .07 mount as before, and the throttle arm was easily repositioned to suit the previous installation. This is not a serious technical review of the TeeDee .09 R/C but a practical test under flying conditions.

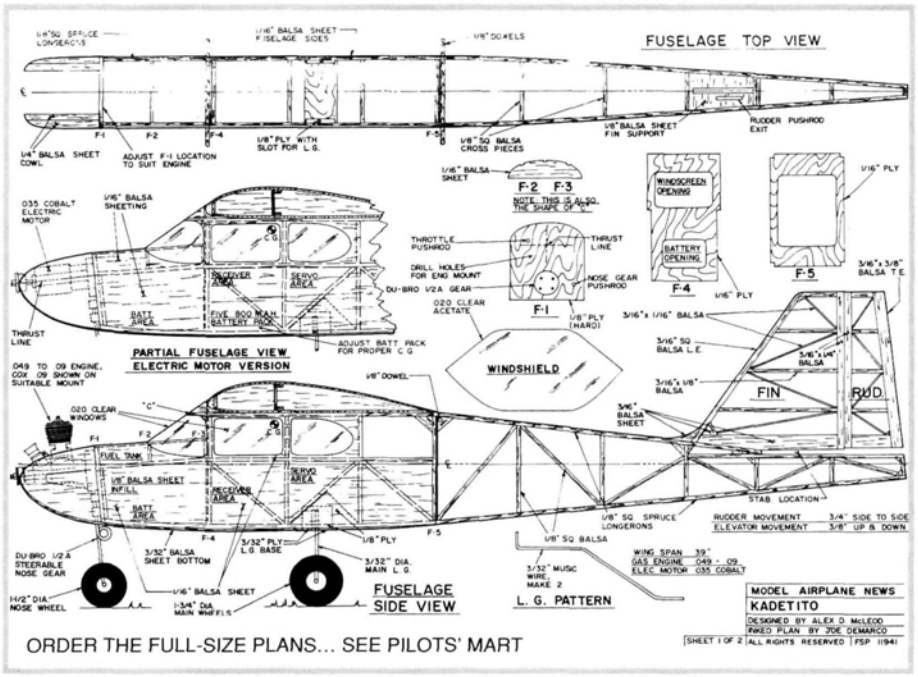
It starts very easily with a small starter, or by hand. It screams on a 6x4 Gray Cox prop and idles instantly after a little running. It's a little more thirsty than smaller engines, but it produces tremendous power for its less-than-4-ounce weight.

I bet the Kadetito would fly quite well with the new Cox Tee Dee .05 R/C, but with the .09, it is a ball. Perhaps I'll get another and build a little twin, or perhaps a mini ducted-fan F-87 Sabre, or a deHavilland Vampire. If you want the excitement of big-plane flying in a schoolyard, I highly recommend the .09 in the little Kadet .





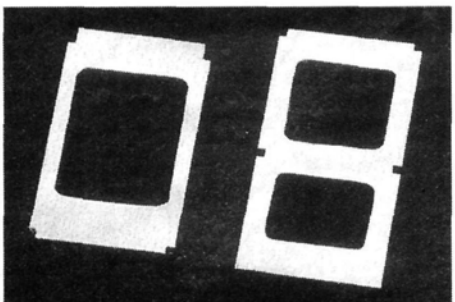
• Top: here, the fuselage sides are fastened together using formers 4 and 5. • Bottom: formers 1, 2 and 3 hold the nose pieces together. Note the Du-Bro ½A nose-gear mount, the homemade, 2-ounce tank and the hole in the firewall for the electric motor.



ORDER THE FULL-SIZE PLANS... SEE PILOTS' MART

sheet used in the forward part of the fuselage sides need not be too hard, but should be firm. Gussets at each butt joint are worth the effort and can later be sanded to a curve with a Dremel tool.

Cut formers 4 and 5 out of 1/16-inch ply. Former 1 is the firewall and should be made out of high-quality 1/8-inch birch plywood.

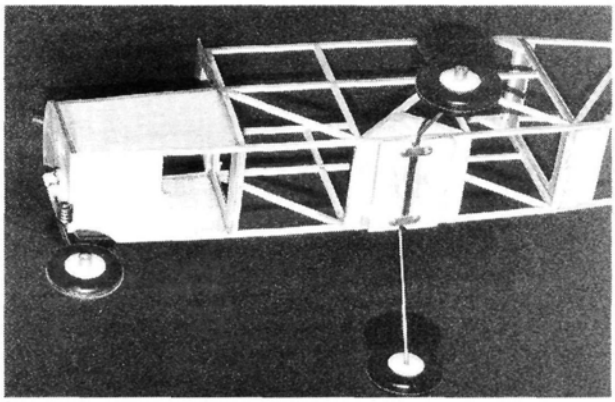


Made of 1/16-inch thick ply, formers 4 and 5 support the cabin and the wing.

Formers 2 and 4 are cut out of 1/16-inch balsa. Assemble the two fuselage sides with formers 4 and 5 at right angles to them. Then install the firewall using a little right thrust and downthrust. Join the tail posts with the crosspieces shown on the top view, but be sure one side isn't bowed more than the other. Next, glue in the remaining crosspieces and the sheet pieces. Drill former 1 (the firewall) for the motor mount and the nose-gear blind nuts, then add formers 2 and 3. Install the Nyrod for the throttle control, the nose gear, the steering, rudder and elevator control.

After selecting your tank (I recommend a 2-ounce tank), glue in the tank floor to position the tank as high as possible. Drill holes in the firewall for the 1/8-inch-diameter brass tank tubes. Install the 1/16-inch-thick balsa-sheet cover over the top of formers 1, 2 and 3. Glue in the ply pieces for the main landing gear, then add the bottom and side balsa sheets, including the cabin windows outline. Former C is glued at a right angle to former 4 where noted on the plans, and a block of balsa is glued above it to fair it into the wing. Now, drill holes in the gussets for the wing dowels.

Bend the main landing gear out of 3/32-inch-diameter music wire, and use a Du-Bro ½A nose-gear assembly. (These are light and quite strong.) I recommend Ace* 1½-inch-diameter nose wheel and ¼-inch diameter main wheels because they're light and strong, too. Nose blocks made of ¼-inch-thick balsa are used to give shape around the engine, as shown in the top view.



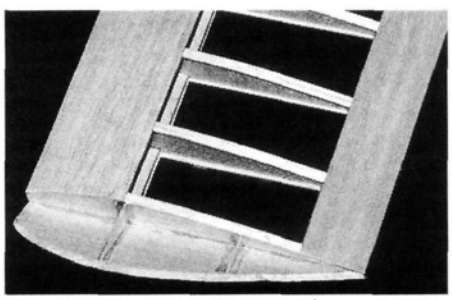
The landing gear in place with its supporting wooden pieces.

WING

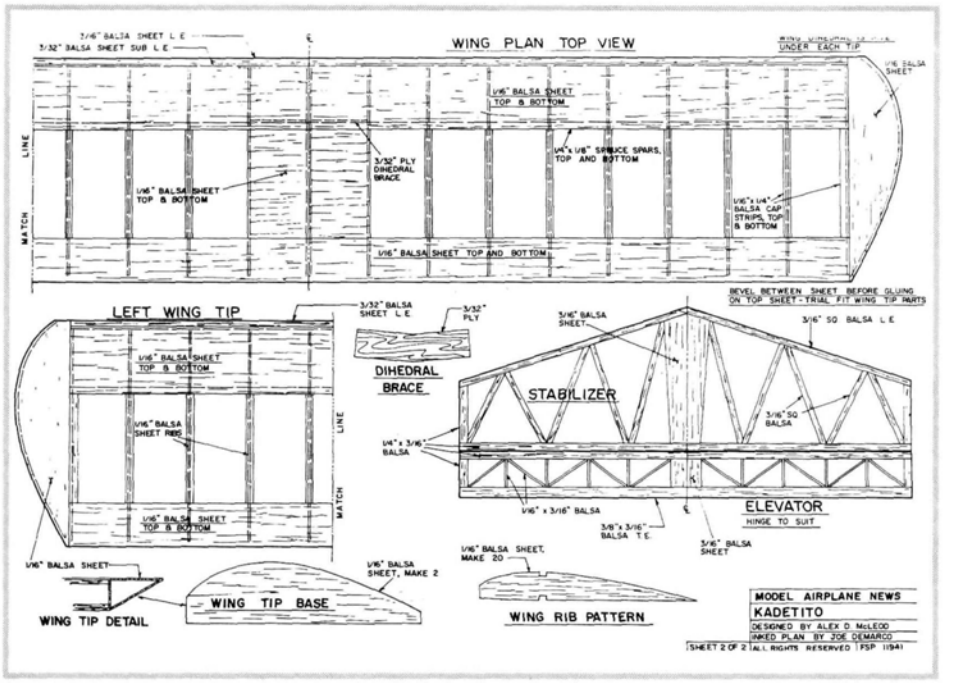
A wing-rib template (made of aluminum sheet—house siding scrap) is used to transfer the rib design from the plans to the balsa. Cut 20 ribs out of firm 1/16-inch-thick C-grain sheet. Pin down a piece of 1/8x1/4-inch spruce on the wing plan where the spar is shown. When you glue the ribs to the pinned-down spar, be sure to angle the center rib of each panel to allow 1½ inches of dihedral under each wingtip.

Next, glue the top 1/8x1/4-inch spruce spar into the top rib notches and add the 3/32-inch-thick-sheet sub-leading edge. Repeat this for the left wing panel, then add the bottom trailing-edge sheet to each. Join the panels by attaching the 3/32-inch birch-ply dihedral brace in front of the spar. To allow proper clearance for the dihedral brace, you must carefully cut out a 3/32-inch part of each center rib in front of the spars.

Bevel the rear of the lower trailing-edge



The wingtips are built out of 1/16-inch-thick sheet. The top spanwise sheet is missing. Note the triangular sheet supports.



FLIGHT PERFORMANCE

First, check that the model balances on or slightly ahead of the main spar. Tail-heavy models are accidents waiting to happen. Check the flying surfaces for warping, and remove any warps by steaming them or by using a heat gun. Adding a little washout in each wingtip is good insurance. By a little I mean that the tip trailing edges twist upward approximately ¼ inch higher than the tip center.

When the moment of truth arrives, be sure the engine runs well and is broken in enough to pull the model properly. I didn't break in my brand-new G-Mark .061, and when I tried a hand-launch on the first flight, the plane staggered around for about 20 seconds until the engine finally revved up. Once it got going, though, I knew I had a fine little airplane.

With its small wheels, the Kadetito needs a fairly smooth surface for taxiing around and taking off. It will take off from a smooth surface and climb out well. Without being touchy, it's quite responsive and will stay within the boundaries of a schoolyard. Landings are quite gentle, if the model is built light. With the Cobalt motor installed, it had to be hand-launched, but flights were a joy to see. Landings were a little faster, but still quite pretty.

sheet so that the top TE sheet will fit, and glue both sheets into place on each panel. Bevel the top of the sub-leading edge, and glue on the top and bottom LE sheets. Vertical webbing in front of the spar can be used before sheeting if you wish, but it might not be necessary. Center sheets are installed in the places shown on the plans (top and bottom), and the 1/16x1/4-inch cap-strips are then added to the ribs.

The tips are also made of 1/16-inch-thick sheet with the grain running with the span on the top and with the chord on the bottom. Triangular pieces of 1/16-inch sheet glued to the end ribs support these tips. Sand the front of the sub-leading edge, and glue on the 1/16-inch, LE pieces. Shape the LE as shown on the plan, and sand the entire wing smooth. Steam out any warping that may have crept in while you were building it.

The tail parts are all built up with 3/16-inch-thick pieces as shown. A built-up tail is a little more work, but it's much lighter and looks pretty through transparent covering. It's really quite strong when small gussets are added to any butt joints that don't have diagonal braces.

FINISHING

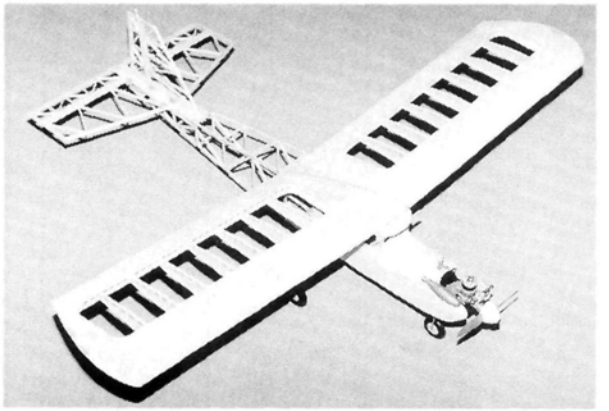
A good transparent covering is the lightest way to go. At 23 ounces, my model weighed a little more than need be. This is because I covered it with red Japanese silk and black butyrate dope trim—mostly to see how much the Kadetito would look like its bigger counterparts. Also, I thought I might try it on floats someday, and silk is a little more permanent.

Whichever way you go, be sure to sand the framework well with coarse, medium, and fine sandpaper. If you cover the model with plastic film, be sure to cut the film away from the parts where they're to be glued together; also do this around the clear window frames so that the glue will join the wood to the sheet windows. RC-56 is excellent for attaching the 0.015-inch-thick acetate-sheet windows. Decorations can be added—striping tape, trim film and various graphics.

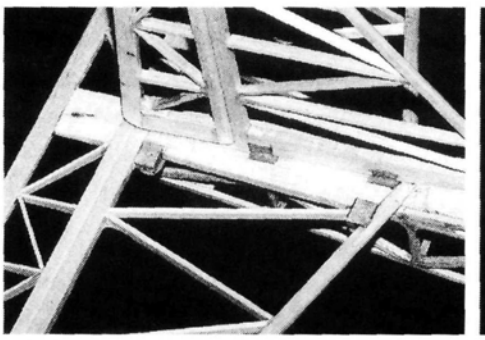
When the finish is complete, install the motor, the landing gear, the rudder and the elevator horns and pushrods. I found the Futaba* 133 servos ideal, but I'm sure most radios of a regular size could fit into the places indicated on the plan. With the mini stuff, there's even room for electric-motor flight batteries.

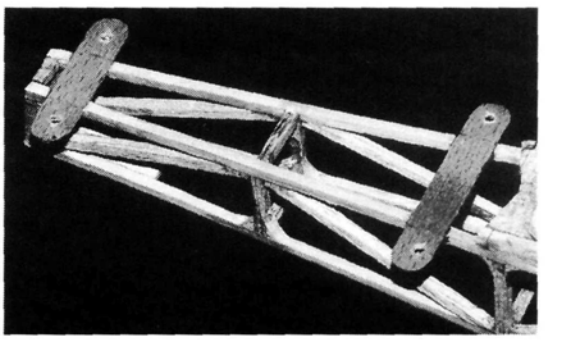
The Kadetito is the littlest Kadet, and it flies as well as the larger ones. It is an excellent model for schoolyards and small fields—responsive, yet stable. I hope you like your Kadetito as much as I like mine.

Addresses are listed alphabetically in the Index of Manufacturers on page 121. ■



The bare bones. Almost too pretty to cover!





• Left: The tailplane and fin are attached to ply blocks with screws—for carrying on vacation! They may be glued in, too. • The 1/16-inch-thick plywood stabilizer support on the fuselage takes 2-56 bolts.

FIELD & BENCH REVIEW

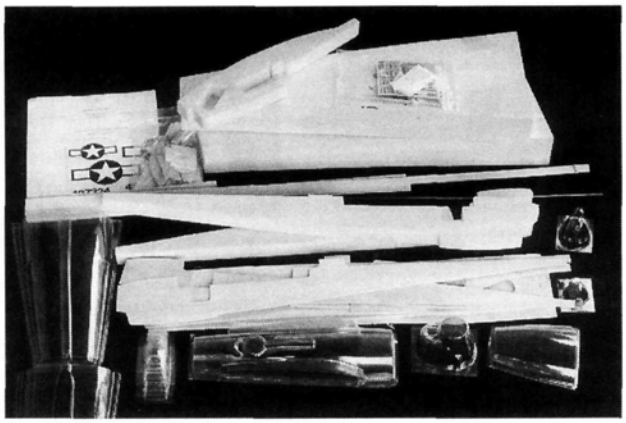
An electric version of Lockheed's classic twin

PHOTOS BY CLYDE GEIST

Kress Jets P-38 LIGHTNING

by CLYDE GEIST

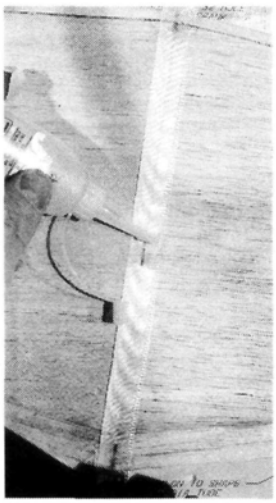
HOW ABOUT constructing your next model out of foam, papier maché, vacuum-formed Vivak™ (the trademark of Pet-G clear plastic), aircraft plywood and even some balsa? You can hold it together with white glue, epoxy, Ambroid*, Kress Jets* Green Goop (latex contact adhesive) and thick and thin CA. Covering will be silk span and craft paper. Your finish will be dope and water-based acrylics and enamels sprayed and brushed on. This scale model will sport twin props, both driven by one electric motor. The result?—a stand-off-scale sport model of everyone's favorite twin—the P-38 Lightning by Kress Jets.



The kit's contents. Foam wings include saddles. Note the clear outer body shells.

As shown by the computer-designed power components and the vacuum-formed body skins, the unique Kress construction process combines vintage modeling techniques (silk span and dope) with state-of-the-art engineering and prefabrication. This timeless marriage of components was conceived by a senior aerospace engineer; but you won't need similar credentials to build this kit.

To report my entire experience of the Kress P-38 would take too much space. I'll therefore present what I liked most and disliked most about this kit, as I built it, exactly as per instructions and manufacturer's recommendations.



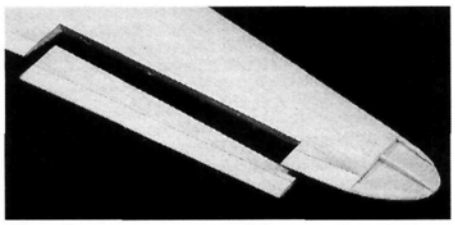
The kit-supplied fiberglass tape is glued into place with medium CA. The result is a surprisingly rigid wing joint.

BASIC LAYOUT

The model is primarily engineered around a balsa-sheeted, under-cambered, foam wing with built-in washout that transitions to a flat bottom. Within the wing are the recommended prop-belt drives (two motors could replace them). One motor in the fuselage pod drives the belts that power the special, lightened, 9x7 folding props. My model required additional nose weight, which canceled out the benefit of these light props. The resulting thrust of 40 ounces (according to EFD 101, Kress Jets Electroflight Design computer program) is truly amazing.

Two removable 4-cell battery packs are cleverly disguised as wing-mounted rockets. They're attractive, cool-running and practical for charging or for use as an "arming" device (diabolical, yes?). But all batteries are heavy, and because these are out on each wing, their weight adversely affects roll rate just a little. The rockets also take some effort to build—about the time required to build a simple model airplane.

The recommended silk span and paint provide a scale-like appearance, but their actual weight of 4 ounces is many times heavier than modern polyester films. The outer shell skins are vacuum-formed to provide complex finishing details at the lowest possible weight.



The ailerons are cut out of the completed wing.

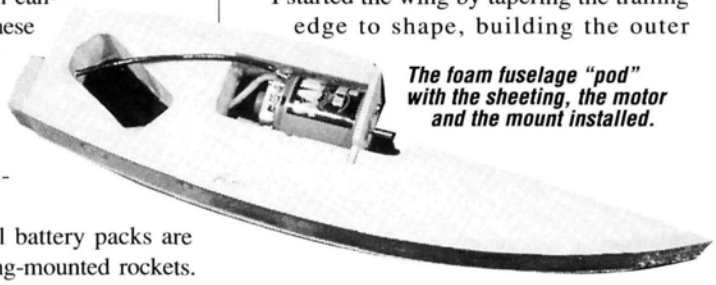
KIT CONTENTS

A large box for a little model! The space is mostly for the pink-foam parts; there's surprisingly little wood—just sheeting, preshaped tail parts and small stuff. The plans, instructions and most of the exotic hardware are included. My complete kit incorporates the optional motor, props, prop-drive system and "rocket" battery tubes. The control arms, cables, rods and clevises, horns and 14-gauge wire I purchased locally.

CONSTRUCTION

The Kress Jets P-38 kit makes use of some innovative construction materials and techniques, so don't expect this to be one of those kits that you just throw together. Some of the steps or materials used may be unfamiliar to you, so take the time to study each assembly step; and don't be surprised if the P-38 takes a bit longer to build than some other kits.

I started the wing by tapering the trailing edge to shape, building the outer



The foam fuselage "pod" with the sheeting, the motor and the mount installed.

TRACKING DOWN THE P-38

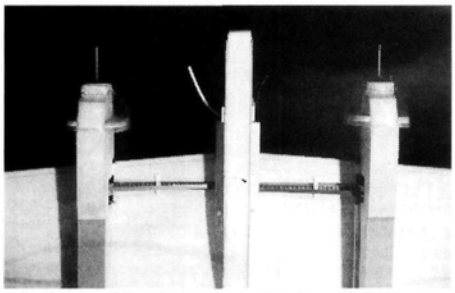
Let's say you have to pick an aircraft to research—any aircraft from any time; an aircraft so well-documented that the job will be a breeze. I bet the Lockheed P-38 will be one of your choices.

As I searched, I continually found the same condensed information and photos—mostly of all-silver P-38s, some with the white, invasion-stripe markings. I knew that Clarence "Kelly" Johnson had his original YP-38 painted silver and yellow for their celebrated military debut. First to see action were 99 P-38E models plus an unarmed black version that ran reconnaissance missions immediately after allied bombing raids during WW II. Surprisingly, no photos of either turned up anywhere I looked.

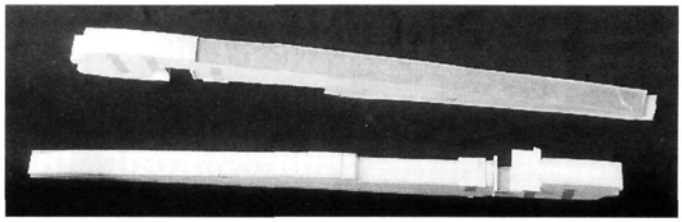
While thumbing through a recent issue of *Model Airplane News*, I came on a classified ad soliciting members for a new P-38 enthusiasts organization in Denmark. I immediately sent my dollar for an information package and received a newsletter loaded with all kinds of up-to-the-minute news on P-38s. Half of the newsletter is dedicated to modeling, the rest to full scale. I'm now a very informed P-38 enthusiast.

Of the 10,038 P-38s produced, there are only five flying and 22 on display in the world, but some incredible efforts are being made to increase that number. I now know of the Greenland Expedition Society and their success in finding not only the "Lost Squadron" of WW II, but also of actually retrieving one of the six P-38s trapped 250 feet below the glacial ice cap at the Kulusuk Tomcat site in Greenland. By contrast, a year before that, another P-38 was recovered by American Gary Larkins from the steamy jungles of New Guinea. What news!

3-inch balsa tips and sheeting the foam with 1/32-inch-thick balsa. The Kress Green Goop water-based contact adhesive for "skinning" dried quickly on the balsa but took hours on foam. I let the cement on the balsa and foam become tacky and then squeegeed the skins down. I glued on the leading and trailing edges with 5-minute epoxy. The ailerons, nacelle and cable-channel openings are cut out of the sheeted wing blanks. Fiberglass cloth impregnated with Goldberg's* Jet medium CA strengthens the wing joint measurably. Next, I epoxied the included "easy hinges" just under the skins.



The underside of the assembled model. The fuselage pod is removable for motor service, but the nacelles aren't.



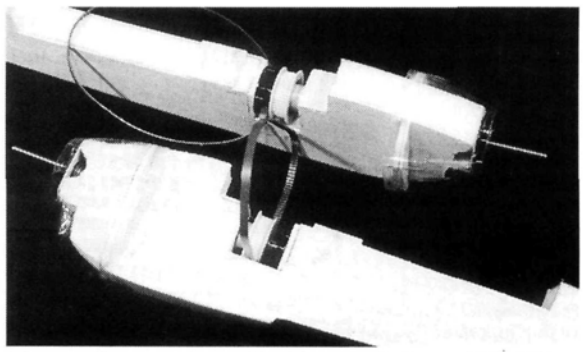
The sheeted-foam nacelles have the wooden add-ons taped into place while the epoxy cures.

The pre-cut, 3/16-inch-thick, sheet-balsa tail assemblies need only to be rounded, have an elevator cut in, and hinged. I attached the recommended silk span covering with 50/50 thinned Pactra* dope. Applied wet on the wing and tail edges, it shrank nicely as it dried. The foam, slab-sided nacelles are sheeted with balsa and secured with Green Goop. Because the remaining nacelle edges are covered with the recommended craft paper and white glue, a 1/64-inch-thick plywood strip provides bottom skid protection.

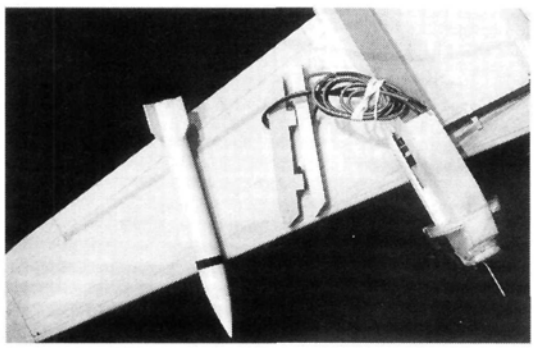
I opted for the Kress twin-drive system and installed the drive-shaft sets. It's a clever system: a front bearing is attached to a plywood bulkhead at the nacelle nose. About 5 inches behind the bulkhead are the pulley and rear bearing. Both pulleys are driven by one motor in the fuselage, and that makes this airplane a virtual flying gearbox.

The removable fuselage mounts are drilled, tapped and bolted to the wing center. The drive belts establish the precise position for the nacelles. Once assured the geometry was accurate (the nacelles parallel and vertical, as shown by the kit template), I epoxied them permanently to the wing.

Construction is complete after the radio and power equipment have been installed. When all the equipment is in place, dots of Ambroid glue will hold the Vivak™ parts on. To complete the assembly, I used epoxy to attach the stabilizer to the parallel booms. The fins are held on



The nacelles, complete with drive sets, belts, and Vivak™ cowl.



The optional Kress "rocket" battery holders with wiring and mounts. Sermos connectors are included with the rocket kit.

SPECIFICATIONS

Model name: P-38
Manufacturer: Kress Jets
Type: Sport
Wingspan: 48 in.
Length: 33 in.
Weight: 52 oz.
Wing area: 310 sq. in.
Wing loading 25.5 oz per sq. ft.
No. of channels req'd: 3
Airfoil type: 6409
Wing construction: Balsa-sheeted foam
Kit construction: Balsa and foam
Washout built in?: Yes
Motor recommended: Astro* Cobalt 035 or Trinity* Sapphire Ferrite 05
Radio used: Futaba Super 7 (as tested) and RCD 535 receiver.
Speed controller: FX-35 by AI/Robotics
Prop used: Kress/Graupner* 9x7 special (2)
List price: $137.50; as built, without motor, $241.85
Optional accessories: Kress lightweight props kit, twin drive package, rocket battery mounts.

Features: carefully engineered aircraft sports a super-strong wing with an aggressive, under-cambered, thin airfoil. The twin drive unit extracts incredible power from an economical 05 motor. Surface detail is enhanced by using weight-saving Vivak™ outer-shell construction. Sturdy craft resists abuse.

Hits
- Efficient wing airfoil and strong construction.
- Unique materials and methods.

Misses
- Inadequate directions, considering the unique materials and methods.

FLIGHT PERFORMANCE

Tom Hunt flew the initial flights for the camera. Conditions were clear, with a temperature of 45 degrees and a 10mph wind. No trim changes were required from neutral. The author based his performance assessment on Tom's comments and on numerous flights on later days under varied conditions.

• Takeoff and landing
Without landing gear, hand-launching is a necessity. The fuselage aft bottom provides a good hold while two fingers behind the wing TE facilitate a necessarily firm toss. Twin props provide impressive climb power and stability. To land, cut power to half and fly down near the deck. Cut power 6 feet up, and glide for about 100 feet onto a smooth grass field. Owing to its low profile and weight, rough runways are tough on this model.

• High-speed handling
It tracks well, yet is responsive at full speed. It snaps out of a tight loop—a warning to me to avoid high-G maneuvers—but a slight dive produces a nice 100-foot loop.

• Low-speed handling
This is best avoided. With stalls up around 20mph, save slow flight for landing flares. Unpowered glide is surprisingly good as long as the nose-down attitude provides sufficient flying speed. Nose up, and the stall will drop nearly straight down, requiring power or 40 feet of altitude to recover.

• Aerobatics
As long as flying speed is maintained, some basic maneuvers can be accomplished. The P-38 can perform upside-down and do loops and, from high speed, three or four continuous rolls or routines that combine them, e.g., split-S's and Cuban-8s. The full-scale P-38 was fast, but not intended for aerobatics; this model is a very scale-like flier.

the stabilizer with CA, and by now, it's beginning to look more like a P-38.

Overall, considering the techniques involved, the kit directions were brief, and the drawing details often seemed elusive yet were always complete—provided I looked long enough.

FINISHING

The aircraft covering is mostly silk span. Craft paper soaked in a mixture of white glue and water covers the unsheeted nacelle and fuselage edges. Two coats of clear Pactra dope provide a sealed surface that's ready to paint. My color scheme is from the *Model Airplane News* cover of May 1939. The XP-38 Pursuit depicted was still not fully developed and was late-breaking news at that time. The striking "between the wars" colors provide super visibility and unusual static beauty.

No fuelproofing is required here, so my choice of paint was unlimited. The yellow is airbrushed Tamiya* acrylic paint. Krylon makes the metallic silver and flat-black sprays. The tail stripes are of MonoKote* scraps. I painted the outside of the clear vacuum-formed shells to match the finish on the non-Vivak™ parts. Painstaking masking of the canopy windows provided worthwhile results. (See "Paint a Framed Canopy" in the July '94 issue of *Model Airplane News*.)

RADIO INSTALLATION

The challenge is to keep weight forward. I mounted my elevator and aileron servos on the nacelle outer panels with double-sided tape. The receiver is likewise held to the inner port nacelle side. The elevator linkage is made of 0.030-inch-diameter music wire in scrap tube guides. The aileron linkage is no. 4 threaded-end-rod to clevis connectors, and the speed controller is in a cutout provided forward in the fuselage.

ELECTRICAL

The optional "rocket" battery holders are assembled using model rocket parts. The breakaway removable brackets are actually mounted by epoxying half a Sermos* connector to the rocket and the other half to the wing undercarriage. Parts alignment is critical and time-consuming, but they're most valuable accessories. Each rocket is designed to hold four, ⅔ sub-C cells (SR* 1100 Max) wired in line.

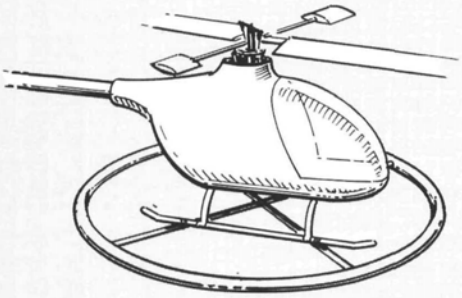
I chose the AI/Robotics* FX-35 speed controller, chiefly because it handles 35 amps, but a compact battery-eliminator circuit with step-down cutoff, a brake and high-rate efficiency make it ideal for this

(Continued on page 96)

HINTS & KINKS

JIM NEWMAN

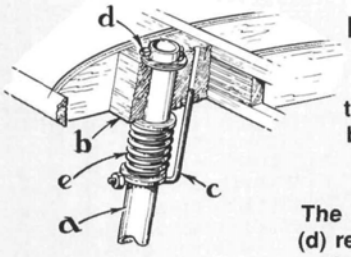
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive,we can't acknowledge each one, nor can we return unused material.



CHOPPER TRAINING GEAR

Spring two dowels into four holes drilled through the inner edge only of an inexpensive Hula Hoop, as shown. Bind this assembly to the skids of your helicopter, and you have training gear for about $4, which will give your model 360-degree protection. It will, of course, be much larger than in the sketch, which is drawn undersize for convenience.

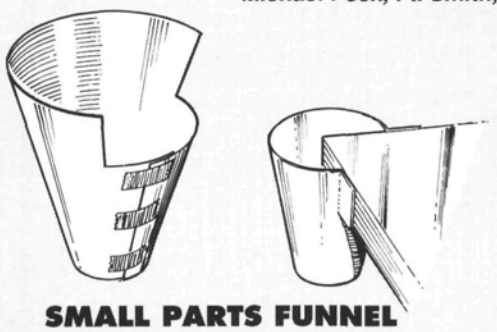
Tauseef Tahir, South Holland, IL



INEXPENSIVE SPRUNG GEAR

Tube leg (a) slides through a beech or ash block (b), while the forward alignment is kept by the rod (c). The cotter pin and washer (d) retain the leg at the top, the spring (e) being captured between two more washers. Use pencil graphite or paste wax to lubricate the leg and block. For small, light models use an aluminum arrow-shaft leg as suggested by Michael, but for larger models, use 4130 steel aircraft tube. The leg or legs popping up through the wing is not unusual—the full-size Tipsy low-wingers did it, too!

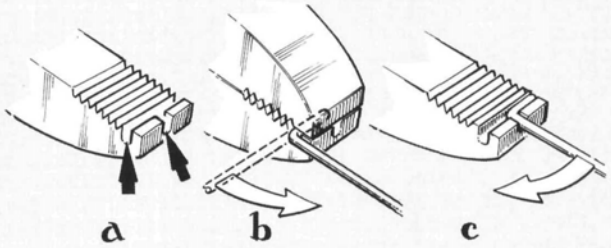
Michael Peck, Ft. Smith, AR



SMALL PARTS FUNNEL

This poster-board funnel is used when scooping all those nuts and bolts you tipped from your jar. Gene found it so useful he made it a permanent fixture on a corner of his bench. Hold the jar below the funnel, then push the screws over the edge of the bench and into the funnel.

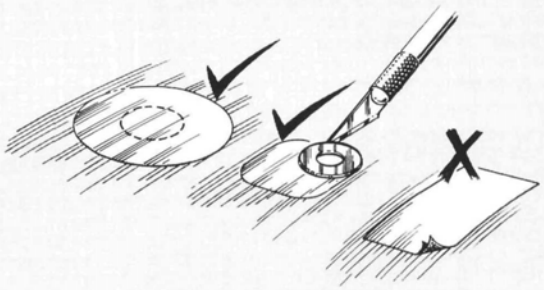
Gene Phipps, Puyallup, WA



Z-BEND PLIERS

With a Dremel grinder, make close-fitting slots (a) in the jaws of some old pliers. Insert annealed wire into the slot as in "b" to make first bend, then do it as in "c" to make second bend. Anneal (soften) the wire by heating cherry-red then allowing to cool naturally in the air. Strength is still adequate for pushrods.

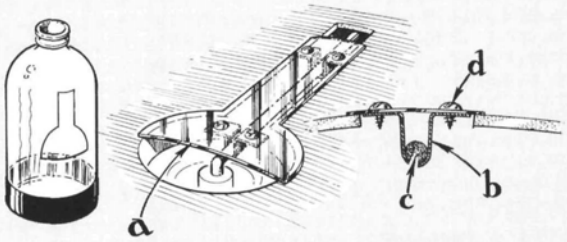
Jim Ryan, Cincinnati, OH



NON-LIFT PATCHES

Covering-film or fabric patches should be circular or have rounded corners, we are reminded again. On square-cut patches, you can be certain a corner will lift. Rounded corners can be made by cutting around a suitable washer. Be sure to tidy up the tear (shown dotted) before applying the patch.

Gene Chase, Oshkosh, WI



TOUGH PLASTIC GEAR DOORS

Cut and flatten a plastic, 2-liter, soft-drink bottle, then cut your gear doors (a), using a wax pencil to mark out. Solder strip brass brackets (b) to leg (c), then use very small sheet-metal screws (d), or aluminum nails as rivets to attach the doors. See-through plastic allows one to see the brackets while tweaking to the proper fit, and a slight curve allows the doors to spring firmly against the wing when retracted. Cover the doors with self-stick trim film, or regular film applied with NO-HEAT solvent. Aviation shears work well on this material.

Ron Prentice, Taunton, Somerset, England

FIELD & BENCH REVIEW

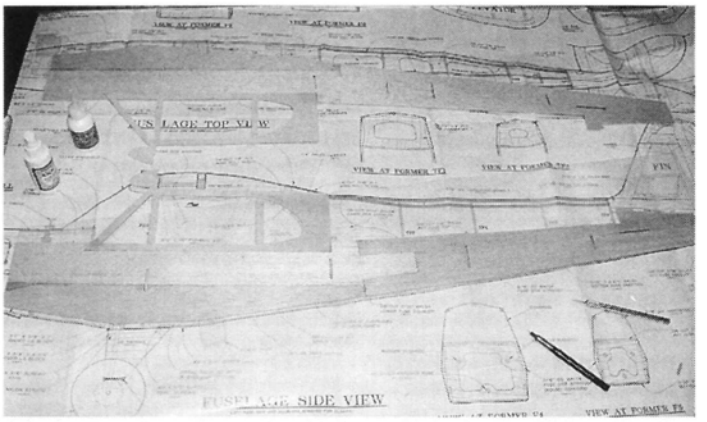
Modern construction techniques in a classic design

GREAT PLANES

Piper J-3 Cub

by JIM ONORATO

THE PIPER J-3 Cub is probably the most recognizable airplane ever built. It first appeared in 1935, and by the start of WW II, only a few years later, more than 5,000 had been produced! This enormously popular, two-man trainer is said to have introduced nearly 75 percent of WW II aviators to flying. It also helped prove to the general public that airplanes could be both safe and economical.



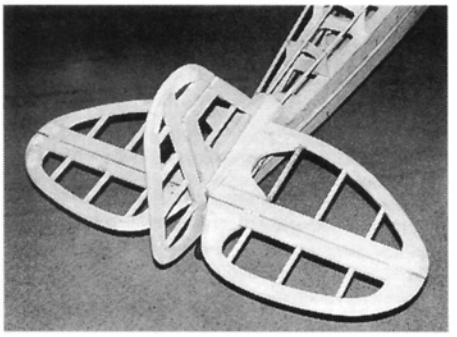
The fuselage is made mostly of balsa and lite-ply. The high-quality die-cut parts fit precisely.

Great Planes'* .40- to .60-size model kit re-creates the original Cub using high-quality materials, engineering and assembly instructions for a sport-scale project that's easy to build and fly.

I've built several J-3 Cubs of various sizes over the years, with either standard or clipped wings, but I had never tried both types of wing on the same kit. Because I'm the kind of guy who can't seem to make up his mind and because I thought that my comments might possibly help others decide which version to build, I decided to try both this time. I obtained an extra wing kit from Great Planes and started on the standard version first.

THE KIT

The J-3 kit features balsa and lite-ply construction with basswood wing spars and struts. The wing struts and the wing leading edge are both pre-shaped. Also included are a generous hardware package, hinges, an adjustable engine mount, formed landing gear, self-adhesive decals, ABS cowl and dummy engine cylinders and a vacuum-formed windshield and formed cockpit windows that pop into place from inside the fuselage for an attractive flush fit. Two sheets of computer-drawn plans and an excellent 52-page instruction manual complete the package. The kit has everything you need to build either the standard- or clipped-wing version. This is a typical Great Planes kit with high-quality materials and excellent-fitting parts.

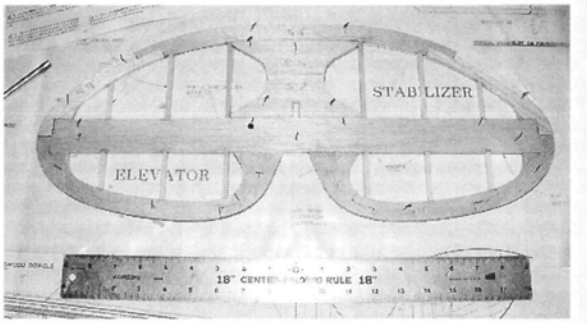


The balsa fairing blocks and the tail parts that are glued to the fuselage add strength to the joints. Notice the hardwood dowels used for the aft fuselage stringers.

CONSTRUCTION

I used Satellite City's* Hot Stuff, Super T and Kick It accelerator for most of the construction. These products make building fast and easy. I used 5-minute epoxy on the firewall, the wing-spar joiners, the wing-bolt blocks and the landing-gear blocks.

• **Tail feathers.** The fin, the rudder, the stab and the elevator are all built directly over the plans using ¼-inch stripwood and die-cut balsa parts. I cut the hinges out of a strip of Ultra-Grip hinge material (included with the kit), but I didn't install them until after the model had been covered. (The hinges are inserted into thin slots in the control surfaces and held in place with a few drops of Hot Stuff.)



The tail parts are also die-cut and have a few stripwood ribs to produce strong, light parts. The stab, elevator, rudder and vertical fin are built flat over the plans.

• **Wing.** The constant-chord wing has a modified flat-bottom airfoil. It's built up with die-cut balsa ribs, two ⅜-inch-square basswood spars and shaped, notched leading and trailing edges. Because the leading and trailing edges are notched to accommodate either the standard or the clipped wings, there are more notches than there are ribs. Make sure that you line the ribs up properly, and don't mix left with right. The wing halves are joined with lite-ply spar joiners and dihedral braces that make a very strong joint.

The aileron servo that's mounted in the center of the wing controls two "barn door" ailerons with pushrods and bellcranks. The ailerons are built separately, and their construction is somewhat unique. Glue a 3/32-inch sheet balsa base into the center of a grooved leading-edge piece, and glue 13 ribs to both the top and bottom of the base. This places one rib at each wing rib location and one between each wing rib. The ailerons aren't

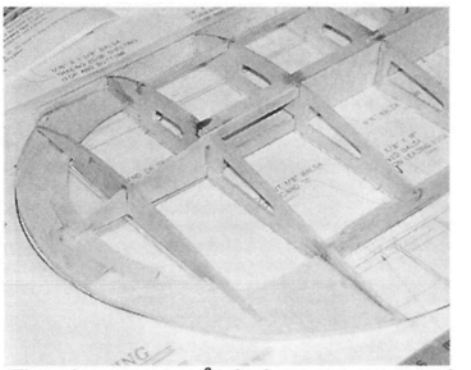
SPECIFICATIONS

Name: Piper J-3 Cub (kit no. Cub4)
Manufacturer: Great Planes Model Mfg. Co.
List price: $134.99
Type: sport scale
Wingspan: 76.5 in. (standard); 61.5 in. (clipped).
Length: 49 in.
Wing area: 820 sq. in. (standard); 653 sq. in. (clipped).
Weight: 7 lb., 12 oz. (standard); 7 lb., 6 oz. (clipped).
Wing loading: 21.8 oz./sq. ft. (standard); 26.0 oz./sq. ft. (clipped).
Airfoil: modified flat bottom
No. of channels req'd: 4 (aileron, rudder, elevator & throttle)
Engine rec'd: .40 to .60 2-stroke or .48 to .80 4-stroke
Engine used: O.S. FS-70 Surpass

Features: mostly balsa construction with computer-designed, precisely fitting interlocking parts and built-up tail feathers. The wing features D-tube construction with a shaped leading edge and has a modified flat-bottom airfoil with a nylon bolt attachment, spruce spars and balsa-sheeted leading and trailing edges. The substantial hardware package includes an adjustable engine mount and hinges. Additional items include vacuum-formed windshield and cockpit windows; a cowl; dummy engine cylinders; self-stick decals; shaped hardwood struts; two sheets of full-size plans; and a 52-page, step-by-step instruction manual that includes tips for creating scale details. The kit has all the parts and instructions needed to build the clipped-wing version.

Hits
- True-to-scale outline.
- High-quality materials and die-cutting.
- Excellent step-by-step instruction manual.
- Vacuum-formed windshield and cockpit windows.
- Good flight performance.

Misses
- The landing-gear design is too flexible.



The wing uses two ⅜-inch-square spars and shear webbing for added strength. Here you see the wingtip construction that uses die-cut parts to form the tip bow.

FLIGHT PERFORMANCE

• Takeoff and landing
The J-3 Cub is a little touchy on the ground because of the relatively narrow stance of the landing gear. Any misalignment of the gear really makes things hairy, so make sure that the wheels are nice and straight. Crosswind takeoffs are especially troublesome so, if possible, keep the Cub pointed directly into the wind during takeoff.

The Cub has a very shallow glide ratio which, with its light wing loading, provides beautiful, scale-like landings. Wheel landings are really pretty, but be prepared for a long approach because the Cub just floats and floats and floats. It just doesn't seem to want to stop flying!

Speaking of floats (pun intended), I outfitted the clipped-wing version with a pair of 32-inch-long, flat-bottom floats, and the model handled extremely well on water.

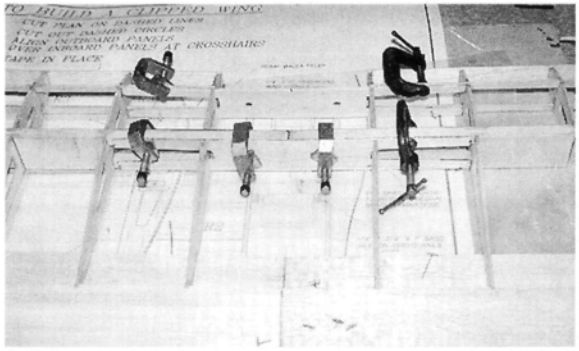
• Low-speed performance
One of the things I like most about the J-3 Cub is its capability to fly at scale-like speeds without losing stability. It has a very low stall-speed, and the stalls are gentle and straight ahead. Both versions flew well and safely at low speed.

• High-speed performance
Even with the O.S. FS-70 at full throttle, the J-3 is still no barnburner, and its top speed isn't really what you'd call "high speed." Neither version exhibited bad tendencies at top speed. What can I say? The model flies like a Cub!

• Aerobatics
The standard-wing J-3 is not, nor was it intended to be, very aerobatic. It will do graceful inside loops, it can be coaxed into a lazy spin, and it will do a slow roll with a lot of aileron, rudder and elevator coordination. It will even fly inverted, but all of that seems somewhat unnatural for a Piper Cub. On the other hand, with an increase in elevator throw over the initial settings shown in the instructions, the clipped-wing version is quite aerobatic and can perform most maneuvers that average sport fliers are likely to try. Axial rolls are pretty fast and require just a touch of down-elevator while the plane is inverted. The clipped-wing Cub does a pretty snappy snap roll and good-looking tailspins. Spin entry requires full deflection of all three control surfaces, but recovery is immediate when the controls are neutralized.

I liked the smooth, stable, scale-like flight of the standard-wing version but, then again, I also liked the aerobatic performance of the clipped-wing Cub. See, I told you I was the kind of guy who can't seem to make up his mind!

The completed Piper Cub is ready to be covered with 21st Century fabric.



The wing halves are joined with die-cut plywood dihedral braces. The small holes in the front brace are for the wing-attachment dowels.

sheeted; the extra ribs provide a nice scale appearance when the model is covered.

Cover the leading and trailing edges and the center section of the wing with 1/16-inch-thick balsa sheeting.

To build the clipped wing, cut the plans at the designated places and realign them so that each wing panel is 7½ inches shorter. The provided reference marks make this a simple task. Other than the span and the number of ribs used, the construction of the clipped wing is the same as that of the standard wing.

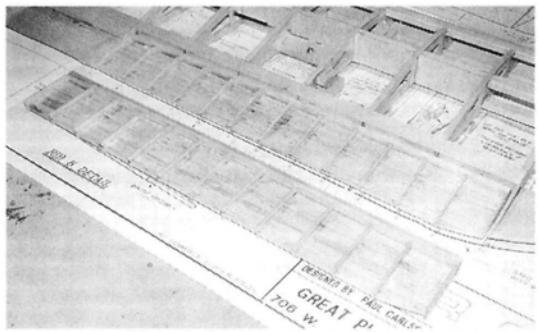
• Fuselage. The fuselage is constructed mainly of balsa with die-cut lite-ply formers and doublers. The die-cutting is excellent, and the parts fit perfectly. Great Planes uses computer-designed interlocking parts that ensure a strong, straight fuselage. To take the guesswork out of positioning the pushrods, all the formers have routing holes.

Sheet the nose forward of the windshield with 3/32-inch balsa. The technique described for wrapping the sheeting around the formers without it cracking really works. Just add several strips of shipping tape to the balsa sheeting before you wet it; it will wrap around the formers perfectly. The three top fuselage stringers behind the cabin are 3/16-inch-diameter hardwood dowels that add to the scale appearance and strengthen the fuselage.

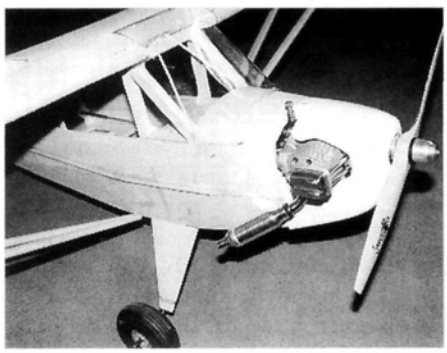
• Engine. The engine you select will determine where you'll route the throttle pushrod and also how you'll cut out the cowl, so it's important to have the engine close at hand during construction. A .40 to .61 2-stroke or a .48 to .80 4-stroke is recommended. For the best scale effect, Great Planes suggests that you use an O.S.* FS-48 Surpass 4-stroke, and for maximum aerobatics, an O.S. FS-70 Surpass will provide all the power you'll need. I chose the latter. The kit includes a Great Planes EM4070 adjustable engine mount that fits most .40 to .60 2-strokes and most .40 to .70 4-strokes. I side-mounted the O.S. .70 Surpass engine and turned the carburetor around 180 degrees to make the throttle pushrod routing more direct. This also let me route the cable under the cockpit floor. If you use a side-mounted 2-stroke engine with a Pitts-style muffler, you'll be able to enclose most of it inside the cowl. The ABS plastic cowl is molded in one piece. If you choose to mount your engine inverted, two ABS plastic dummy engine cylinders are provided to add scale realism. Only one is used with a side-mounted engine.

FINAL STEPS

The two-piece, torsion-type landing gear is mounted in grooved hardwood blocks and is the only part of the kit that I didn't particularly like. I found that they bent rather easily; this caused the main wheels to get out of alignment and made ground handling difficult. The two-piece gear also makes it difficult to add permanent cross-braces. The 1/8-inch die-cut plywood landing-gear fairings are attached to the fuselage with nylon landing-gear straps and to the landing gear with small rubber bands. This is a neat way to keep the fairings from being knocked off



The construction of the ailerons is a bit unique in that they are made with a center sheet piece with half ribs glued to its top and bottom surface. The center sheet is glued into a slot in the rear of the formed leading-edge part. After the model has been covered, the ailerons have a pleasing, scale appearance.



I powered my J-3 with an O.S. FS-70 Surpass 4-stroke engine. Mounted on its side (as shown), the engine is easy to install.

J-3 CUB

when the landing gear flexes, but it isn't very scale-like.

It's easy to install the radio gear in the Cub's roomy fuselage; the gear is entirely concealed under the cockpit floor. Following the "how-to" tips in the manual, I added a pilot figure, seats, a dummy fuel gauge and optional wing struts for additional scale effect. I didn't install landing-gear cross-braces.

The vacuum-formed windshield and cockpit windows, which I installed after I had covered the model, are very well made and fit perfectly. I simply popped the cockpit windows into place from the inside and attached them with R/C-56 glue applied to the flanges inside the cockpit. This provided a neat, attractive, flush fit.

FINISHING

I used Coverite's* 21st Century Cub Yellow (what else?) fabric for the covering and matching 21st Century spray paint for the cowl, the landing-gear fairings and the struts. I used the registration-number decals provided with the kit on the standard wing, but I cut 4-inch letters and numerals out of 21st Century black fabric for the clipped wing. If you build the clipped-wing version, you'll have to use smaller letters or shorten the registration number because the clipped wing just isn't long enough for the seven large numbers and letters provided.

Even on floats, the Great Planes Piper J-3 Cub is a great flier. I used 32-inch-long foam floats.

CONCLUSION

The Great Planes J-3 Cub is a high-quality, easy-to-build kit that looks great on the ground or in the air. The standard-wing version, which has a light wing loading and inherent stability, is an excellent first scale kit for beginners, and the clipped-wing version is aerobatic enough to satisfy more advanced pilots. I thoroughly enjoyed building and flying this sport-scale kit of a popular classic, and I highly recommend it for both beginners and sport fliers.

**Addresses are listed alphabetically in the Index of Manufacturers on page 121.* ■

by MICHAEL LACHOWSKI

'94 World Soaring Jamboree

Fliers from five countries and 21 states gather in southeast Washington State

NINE DAYS OF slope and thermal soaring competition, more events than one person could ever enter and evening talks by Dr. Richard Eppler and Dr. Michael Selig made the World Soaring Jamboree in the Tri-Cities area in Washington impressive. Several hundred sailplane modelers from all over the USA and five other countries attended the WSJ. It was well worth the long trip from New Jersey to Washington.

Wil Byers and the soaring clubs involved in organizing the WSJ should be congratulated for putting on a tremendous event. Major sponsors included Slegers Intl.*, R/C Soaring Digest*, JR Remote Control* and the Richland Chamber of Commerce, and many other model companies also contributed significantly to make the WSJ a success.

Dr. Richard Eppler and Dennis Phelan discuss F3B requirements.

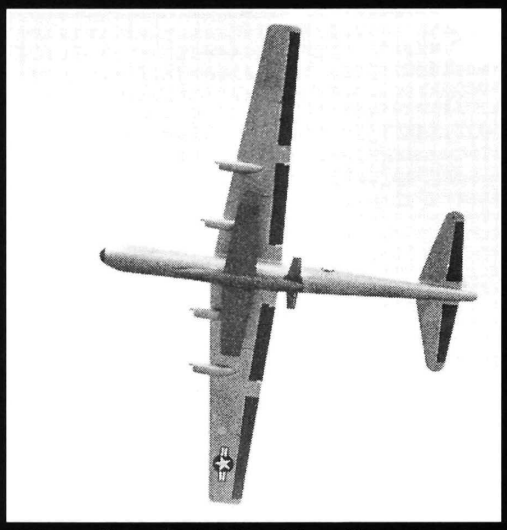
The Nampa, ID, crew prepares to launch Tony Elliot's scale ASH-25.

Keith Thompson of British Columbia demonstrates impeccable freestyle slope flying with his Rodent in 45mph wind at Eagle Butte.

The Richland area has great slope-soaring and thermal-soaring sites. Eagle Butte and Kiona Butte provided excellent soaring conditions, and a sod farm in Pasco and the Hanford High School were the sites for the thermal-soaring and hand-launch events. There was something for everyone—even some novice slope racing, novice thermal soaring and just plain slope fun flying.

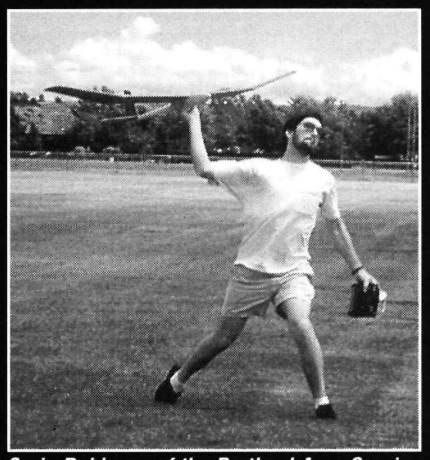
THERMAL DURATION

Events ranged from traditional Unlimited thermal duration to F3J and F3B. Weather conditions proved to be interesting at times with several days of very light winds and a few days with some really strong winds. The two-day Unlimited event started with very light winds—great conditions for floaters—and ended on the second day with wind gusts of more than 40mph. To deal with these conditions, I flew a 2-meter Spectrum* with 2½ pounds of ballast and a 20-ounce-per square-foot wing loading. Of course, they had real fun at the slope with the highest wind speed being more than 70mph. Unlimited and 2-Meter scoring was calculated using the local Northwest Soaring Society system. On shorter flights, the 100-point landing was really worth much more, because the raw score was multiplied to make it 1,000 points for the round. Standard class used a man-on-man format—a first for many of the pilots. At least everyone understood the scoring system.



A Power Slope Scale B-29 with an X-1 rocket plane slung below makes a low pass before dropping the X-1 to re-create the historic flight that first broke the sound barrier. The sailplanes were built and flown by Hal Weber, Wayne Stanford and Ed Mason of Nampa, ID.

Jack Siles organized the F3J event. This was a first for many in the area. Everyone needs to learn to bring launching equipment. Because you can re-launch, you really need two sets of lines. The wind was uncooperative and nearly calm. The pilots from England expected light winds, so they were unprepared for the winds in Unlimited. Now they had a chance to use their light-air equipment. In some instances, they used two towmen: one ran with a pulley for a two-to-one tow at the start, and the other, holding the end of the line, ran near the end of the launch to get a zoom. Another group tried a three-to-one pulley setup, but I couldn't see any advantage in launch speed or height. I think this was the most enjoyable of all the thermal duration events.



Craig Robinson of the Portland Area Soaring Society launches his original design, "Sunrise," in the hand-launch event.

A strong wind in the morning proved interesting for the hand-launch event at Hanford High School. The field is big enough for hand-launching, but the winds made it seem too small. I started the morning with 10 ounces of ballast in a 9-ounce Monarch*. Gradually, the winds slowed down to some reasonable flying conditions, but it wasn't possible to put in a round with all maxes. A novice thermal day was held earlier in the week at the high school. It was nice to see events for everyone at every skill level at the WSJ.

The week ended with F3B and, unfortunately, we had to fly in calm winds again. Dr. Eppler watched the various tasks and talked with the pilots. I hope he uses the information to design some new airfoils, because a good F3B airfoil also makes a good AMA thermal-duration airfoil.

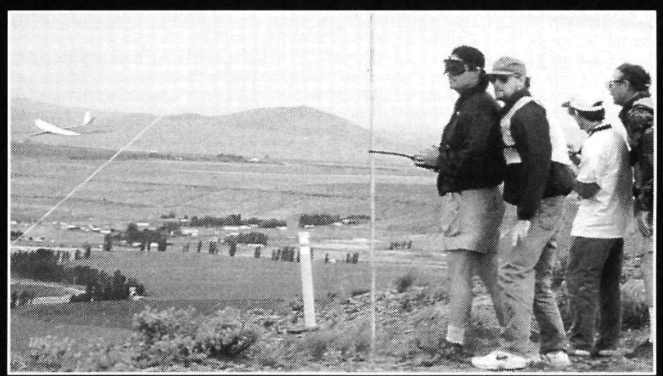
SLOPE SOARING

Probably the best flying site of the WSJ was Eagle Butte, the site used for most of the slope events. Because I don't have any slope sites nearby, flying at this site made the trip worth all the trouble. I had my first chance to try out some slope racing (or how to make sure your sailplane doesn't have a long life!). For the Unlimited racing day, the winds came up at Eagle, and everyone was able to fly with maximum ballast. Close flying and midair collisions at high speeds provided plenty of excitement for the spectators. This was another chance for Dr. Eppler to look at the extreme flight conditions we put our sailplanes through to have a little fun and go fast.

The week started with a slope scale fun fly and a general slope fun fly, which helped to provide activities for everyone at every skill level. There was one day of novice slope racing; this was a chance for people who had never been involved in racing to give it a try. Photographer Dave Garwood took some time out from shooting to have some fun trying slope racing. Joe Conrad and the Seattle Area Soaring Society did a superb job organizing the race days.

SCALE

I really enjoyed seeing all of the scale models. Unfortunately, I wasn't able to watch much of the flying because of schedule conflicts. One evening, scale sailplanes filled the area around the pool at the WSJ headquarters. There were many large models, and some were even detailed to the level of precision scale models.



The pilot and caller lineup at a novice slope race. Front to back: Keith Thomson, Paul Naton, Guy Ruso and an unknown novice.

Evenings With Dr. Eppler and Dr. Selig

Mike Lachowski, "Model Airplane News" soaring columnist (left), and Michael Selig, sailplane aerodynamicist.

The evening activities complemented the days' soaring events. Dr. Richard Eppler's first discourse was on the history of longitudinal stability in flight; the model layout and proportions we take for granted were once unknown. Many configurations were tried. He utilized some simple models, flown during the talks, to illustrate the reasons for the success or failure of various attempts at manned flight.

Dr. Eppler's second presentation covered some of his recent work on a theory of induced lift. Some of the concepts were quite technical, but one of the interesting early results is that a wing with the last 25 percent of each wing panel tilted up actually has more lift than a straight wing. Dr. Eppler and doctoral students have produced codes that solve the equations describing the wing in three dimensions that don't require super computers. These codes let them explore different wing configurations and angles.

Wil Byers, Dr. Richard Eppler and Deiter Mahlein discuss hand-launch sailplane designs.

Dr. Michael Selig gave us an overview of some of his recent work and progress on the wind-tunnel testing effort at the University of Illinois at Urbana-Champaign. He introduced a new airfoil—the S7012, for which I had constructed the test model. This is one of the first airfoils tested in the wind tunnel. There were two design criteria for this airfoil: to go fast with low drag (almost as fast as an SD7003) and to have more lift than an RG15. From my limited experience with a 60-inch sloper and a new F3B model, it looks as if it works. Remember, this testing effort is modeler-supported. Michael needs more support in the form of donations, model building and some equipment (see Tom Atwood's editorial in the July '94 issue).

This Power Slope Scale P-51 Mustang built by Peter Marshall of British Columbia is shown in the landing zone of Eagle Butte. The immaculate model has retractable landing gear.

Intense concentration among (right to left) Unlimited thermal pilot Joe Conrad, timer Sherman Knight and spotter Tyler Moore.

Below: Erik Eriche and Peter Marshall assemble Erik's D-OBS vintage scale sailplane for the thermal flying portion of the scale judging. Erik flew this magnificent plane a few days before on the slope at Eagle Butte.

George Zatloka and Phil Renaud move pretty well together in two-man-tow technique in the F3J hand-tow thermal event.

The best part of the scale events is flying. In thermal scale, the current AMA rules are just like the power sport scale rules, and you just don't do that much flying. At WSJ, one part of the score was accumulating time aloft—40 minutes for modern class and 30 minutes for vintage class. I think scale contests should include events just like this, so everyone can go out and get plenty of flying in during the day.

On the slope, things were even more relaxed. The only competition in the fun fly is for Pilots' Choice awards. Eagle Butte is perfect—a great slope and a really nice landing area. Included among the models of full-size gliders were plenty of powered models (all the features, even retracts on a P-51, and none of the noise). Unfortunately, the weather didn't cooperate for the Power Slope Scale Fun-Fly day.

In addition to the flying and seminars, the WSJ headquarters was the location for several vendor displays. There was plenty of time in the evening to talk about models, supplies, equipment and experiences. If you're unfamiliar with the area, there are plenty of non-flying activities. I made some trips to Mt. St. Helens and found this little town called Leavenworth on the western side of the Cascades that looks just like Germany!

Thanks to Wil Byers, the Mid-Columbia Soarers, the Moses Lake R/C Modelers, the Seattle Area Soaring Society, the Portland Area Soaring Society, the Oakalla Hawks RC Gliding Club, the Albuquerque Soaring Association, the Inland Empire Soaring Society and the North American Scale Soaring Association for organizing and running the first World Soaring Jamboree. With the assistance of the Richland Chamber of Commerce, JR Remote Control, Slegers Intl. and a host of other sponsors and manufacturers, the WSJ was a wonderful success.

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FIELD & BENCH REVIEW

ESTES Strato-Blaster

BY TIM DIPERI

PHOTOS BY TIM DIPERI

WHEN TOM Atwood asked me if I'd like to do "something different," I said "Sure." I didn't suspect that my "different" project would accelerate from zero to 200mph in 4 seconds! But I've long been a model-rocket enthusiast. Back in the early '70s, when I first flew one, Estes* manufactured a wide variety of both rockets and accessories. Over the last few years, Estes has started to offer rocket-boosted R/C airplanes, including the Strato-Blaster, which I review here.

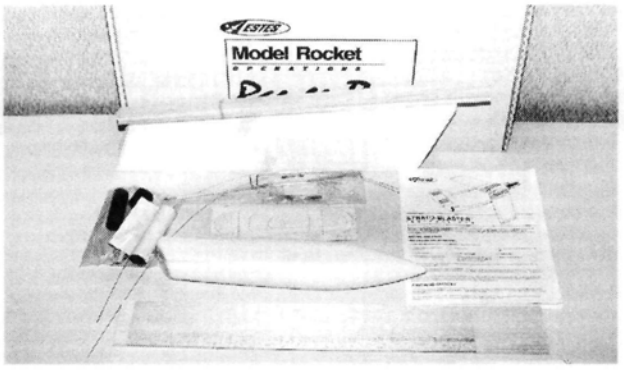
THE KIT

The kit has very few parts because the foam wing and high-impact plastic fuselage were almost complete right out of the box. The kit also included four die-cut wooden sheets, enough 1/32-inch-thick sheet wood to cover the wing, a package of hardware, a rocket engine-pod mount, a nice set of decals and a comprehensive instruction book.

BUILD A BLASTER

• **The wing.** This is foam-core sheeted with thin balsa. To attach the sheet balsa to the foam, the instructions suggest that you coat it with epoxy and then apply to the wing, or use a foam-safe contact cement. I tried the latter, using Dave Brown* Sorghum contact adhesive with no problems.

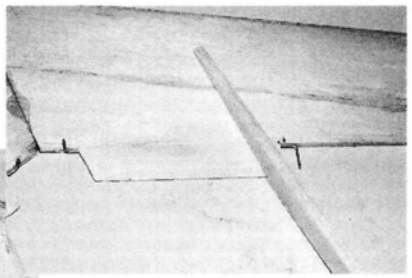
When I had glued the sheets to the top and bottom surface of each wing, I put the wings back into



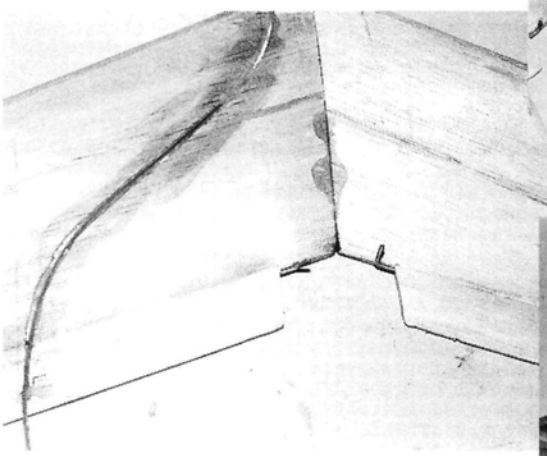
The kit's contents are simple; note the "low-time" molded fuselage.

This shows the linkage to the Strato-Blaster's elevator. There are no rudders.

For rocket-assisted boost or ½A glow



Here, the tail boom is being trial-fit to the wing.



Note the routing of the elevator-control pushrod.

the core bedding, i.e. cradle, from which they had been cut. To prevent the wing from warping while the adhesive was curing, I put several books on top and set everything aside for 12 hours.

The leading and trailing edges were then epoxied into place and sanded to shape. Because this wing is tapered toward the tip, the ailerons are attached temporarily and then sanded to match the taper. A slot must be cut in the wing to accommodate the elevator pushrod. (I used a tool made of two razor blades and a balsa spacer for this.)

The pushrod was then epoxied into place below the surface, then a bead of epoxy was applied to ensure the strength of the wing. Some light sanding was necessary afterward.

• **Fuselage.** The Strato-Blaster has a stylish molded-plastic fuselage that requires a little minor preparation that can be done with a sharp X-Acto knife, a drill and some sandpaper. Start by cutting the plastic where the wing will slide into the fuselage. If you use a sharp knife and take your time, this is easy to do; when you've scored it a few times, the plastic will break away.

Next, cut out the hole in the back of the fuselage where the rocket pod will be mounted. It's easiest to do this by drilling small holes around the circumference and then cutting the piece out with a knife. Then wrap sandpaper around a paper tube and smooth out any imperfections.

Now cut out the nose hatch by scoring it several times with a sharp knife until it breaks away cleanly. The nose hatch and fuselage only need to be lightly sanded to remove any sharp edges. The nose-hatch latch is made of thin brass tube and an L-shaped piece of 1/16-inch piano wire. Two canopy stiffeners are installed using CA. A small piece of scrap plastic is used as a forward tongue to hold the canopy in place.

Finally, after a clearing hole has been cut out of the bottom of the fuselage for the launch lug, the lug is glued to the inside surface of the fuselage.

SPECIFICATIONS

Model name: Strato-Blaster

Manufacturer: Estes

Type: sport/rocket-boosted glider

Wingspan: 34.5 in.

Weight: 19 oz. as built*

Length: 32 in.

No. of channels: 2

Radio used: Futaba

Airfoil: semisymmetrical, swept, tapered

Wing construction: foam and balsa

Kit construction: plastic, foam and balsa

List price: $69.99

Wing area: approximately 219 sq. in.

Wing loading: 12.5 oz per sq. ft. as built**

Recommended engines: Estes D or E plugged engines or ½A glow engine.

*Manufacturer-designated weight is 13 to 16 oz. with a rocket motor.
**Manufacturer estimates 9.2 to 10.5 oz. per sq. ft.

Comments: this quick-build kit includes foam wings, an ABS plastic fuselage and all necessary hardware. It can be built for rocket-assisted ascent or ½A glow power, or flown on the slopes.

Hits
- Pre–molded fuselage.
- Excellent instructions.
- Good-looking, unique.
- Designed for rocket, ½A, or slope.

Misses
- Flights are fairly short using rocket power, but would be longer using ½A power.

FLIGHT PERFORMANCE

• Takeoff and landing
The Strato-Blaster is launched at approximately 60 degrees to the horizontal. During the tests, the wind was at approximately 10mph, and only slight corrective control was necessary during its boosted ascent. The powerful "E" engines were more than adequate to loft this ship several hundred feet. A typical flight lasts no more than a few minutes. Landing this light airplane is straightforward for this type of model. A simple skid to a stop (belly landing) is fairly easy, and the model holds up well.

• Slow-flight performance
As the nose is pulled up, the airplane slows down nicely and displays a clean, straightforward, non-violent stall, despite its jet-like lines. At lower speeds, the effectiveness of the ailerons is greatly reduced.

• High-speed performance
During its boosted portion, the airplane accelerates quickly. After transitioning to horizontal flight, it has a stable glide at speed. When gliding, I noticed a slight "wing wobble" in the roll axis, but this did not affect control. During some deliberate high-speed dives, the airplane exhibited no unusual tendencies.

• Aerobatics
During the first day of testing, my good friend Kevin Norton agreed to pilot the airplane during takeoff so I'd be able to take photos of the liftoff. Before I had time to put the camera down, he had easily executed a beautiful vertical roll. In horizontal flight, the Strato-Blaster loops and rolls well, and very little down-elevator is needed in the inverted position.

• **Powerplant.** The Strato-Blaster is designed to use the large "D" and "E" solid rocket engines. The engine pod is made out of a thick-wall cardboard tube that has a metal "lock" to hold the engine securely until it has to be removed (after each flight). A thrust ring and cap are glued into the back of the pod to ensure the integrity of the fuselage when rocket power is being transmitted to the aircraft.

Finally, the entire power pod is glued inside the fuselage. Because of the rocket's high acceleration, it's important that this glue joint be a *good* one.

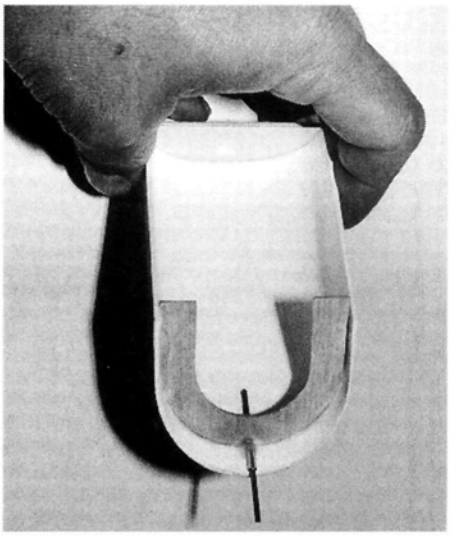
• **Tail assembly.** The rocket-engine blast would damage a conventional tail, so the Strato-Blaster has two booms that extend back from the wing and support twin vertical fins and a raised horizontal stabilizer.

Each boom is made of two, die-cut balsa pieces and two pieces of flat stock cut to size. When the stab and elevator assembly had been completed, the vertical fins were glued to it. Finally, the tail assembly was glued to the two booms.

• **Attaching the wing.** The wing is permanently glued to the fuselage; I used thick CA on the top and bottom of both sides of the fuselage. There were a few small spaces between the wing and the fuselage, and I filled them with wood filler.

FINISHING

When the tail boom/empennage had been completed, I painted it and covered the wing. I used Coverite's* 21st Century paint and Goldgerg's* Ultracote and was very pleased with both. To ensure good paint adhesion, I prepared the fuselage by lightly scuffing it with 400-grit wet-or-dry sandpaper.



The pin is part of the nose hatch-latch mechanism.

A view of the installed Futaba 133 servos and full-size receiver.

FINAL ASSEMBLY

The tail-boom assembly is mounted on the wing using epoxy and dowels. Prior to being mounted, some of the wing's covering material must be removed to expose the wood. It's imperative to avoid damaging the balsa, so I marked the mounting location before I covered the wing and covered around it.

The elevator pushrod is snaked through the left tail boom as it's glued to the wing. The boom assembly is fairly flexible, so it was possible to secure one side at a time.

Finally, the control surfaces were attached using the supplied hardware. A thin cable is guided through the elevator-control tube and attached to the elevator-control horn.

RADIO INSTALLATION

This airplane requires a mini radio system. I chose Futaba's* S-133 servos, 9ZHPS transmitter (which is really the cat's meow!), 250mA battery and 129-DP receiver (full-size). I only had to cut the hatch bulkhead slightly to accommodate the full-size receiver.

I really enjoyed building and flying this model. Its unique appearance and takeoff captured lots of attention at our flying field, and I look forward to flying it with the .049 conversion (the kit included this option, minus the engine) and on the slope.

**Addresses are listed alphabetically in the Index of Manufacturers on page 121.* ■

CYBERSPACE

RESOURCES FOR THE MODELER

If you want answers, you can probably find them online

by DAVE GARWOOD

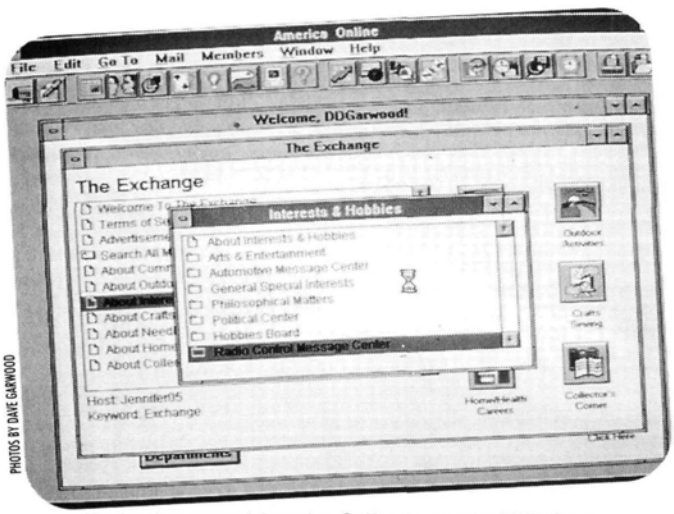
WITHOUT LEAVING the comfort of your own home, would you like to discuss modeling questions with other modelers? Compare notes on kits? Get help with specific technical challenges? If you're just getting started, get basic field tips? Talk to manufacturers? Obtain weather forecasts before planning a flying excursion? Swap reports or articles (files) on modeling subjects? Participate in a group modeling discussion? Research a scale subject that you plan to build?

Your ticket to traveling in "cyberspace" (the nickname for the world of online information access) is a PC, a modem and a telephone line. Make the trip, and you'll find yourself having fun chatting with other modelers around the country and all over the world; and it won't cost you an arm and a leg. This article takes a brief look at the major categories of cyberspace resources for modelers: electronic bulletin-board systems (BBSs), commercial online information services and the Internet.

Online Information Services

There are five nationwide commercial online information services (OISs) that your computer can connect to from hundreds of cities with a local call, or from remote areas with an 800 number. As in the case of a BBS, you don't need to be "live" talking with others to use these services (although live discussion forums are available). Messages, comments, answers to questions and the like accumulate under specific topic headings, and you can copy the entire discussion to your computer in a few seconds. We've seen explosive growth and intense competition among online services in recent months, as each of the companies vies to offer better, less expensive and easier access to more and more information.

I spent time on each of the major services, looking at three topics of interest to modelers: aeromodeling information and discussion bases, weather reports and forecasts and flight simulators. This report is only a snapshot in time; these services are constantly evolving and expanding.



PHOTOS BY DAVE GARWOOD

Navigating around America Online is a typical Windows operation; click on a topic to open the next level box.

America Online (AOL)

Using a Windows front end, AOL provides a crisp, clean, easy-to-view "graphical user interface" (a Macintosh or Windows-like screen format that relies on pictures, icons and boxes as opposed to just text)—the best in the business at the time of my online research. The R/C message center has active discussion on several modeling topics. In one session, I saw a notice about the Downeast Soaring Club's (Maine) Soaring Lobster Festival, a brief review of the Airtronics Falcon 880, a contest schedule for an Arizona club and directions to a free flying site that offered free instruction and was sponsored by Marvin's Models in Mankato, MN. America Online has no resident air-combat or other online flight simulations, nor does it support two-player modem connection of your own games.

Weather forecasts, up to five days in advance, are provided for large U.S. and overseas cities (for instance, there are 14 locations in New York state). However, information is limited to high and low temperatures plus pre-

Bulletin Board Systems

BBSs are used to send and receive e-mail, carry topical discussions, distribute computer programs and files and play computer games. There are more than 45,000 public-access electronic dial-up bulletin board systems in the U.S. (There may someday be hundreds dealing with modeling topics; see the sidebar listing several modeling oriented BBSs.) New boards and new users are coming online every day.

Almost all BBSs are designed to be used at a basic level with little or no reference to written instructions, although many have documentation available to download to your own computer. After your computer modem has been installed and your telecommunications program has been configured, just call the BBS of your choice, request a new account, and explore the board. Some BBSs wish to verify your identity by a return phone call or a written document. Some charge a small fee for access to the board, although many do not.

The store where you purchase your modem may have a list of local BBSs, and the computer guru at work or school will know some BBS numbers. Several magazines (see the accompanying sidebars of BBS sources) and BBSs themselves often post lists of other BBSs.

PRODIGY

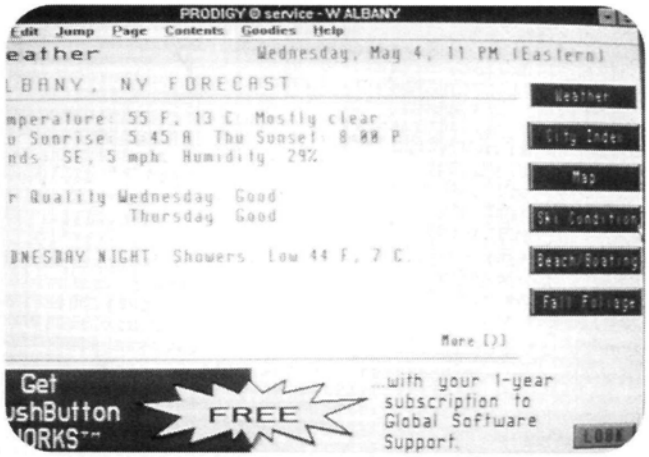
The largest service by the count of registered users, Prodigy is colorful, but slow. The model airplane discussion area is part of the "radio control" area, so messages about R/C airplanes are combined with messages about R/C cars and boats. There is active and extensive discussion of R/C aeromodeling.

Prodigy's Accu-Weather forecast maps are easily accessible with a few mouse clicks. Ads at the bottom are common on Prodigy.

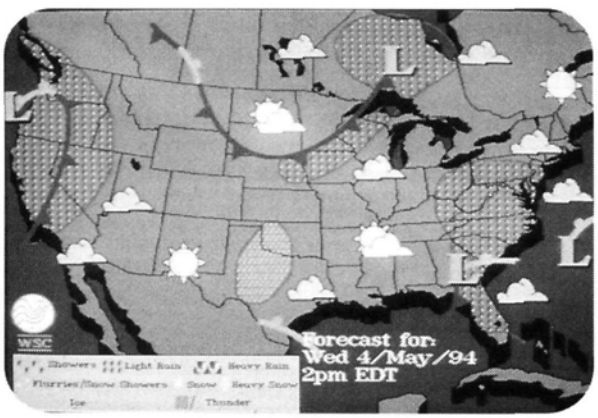
The weather information available is decent, but limited. Twenty-four-hour forecasts for about 300 North American and a few international cities are available, and they show temperature, sky conditions, precipitation and winds. The weather maps for the continental 48 states show isobars, temperature and precipitation. Slightly more detail is given in regional maps on the 48 states. The weather maps are clear and comprehensive.

Prodigy has no online air-combat or flight-simulation games. Prodigy's most impressive feature is its presentation of news photos and other graphics. Its least impressive feature is advertising on most screens. It's the only major service that has commercials.

Prodigy costs $14.95 per month for unlimited evening access to core features, two hours of premium features and 30 e-mail messages for up to six members of your household. For more information, call (800) PRODIGY.



Sample local weather forecast.



America Online displays a WSC weather-forecast map.

cipitation. Weather maps and satellite photos are provided by WxServCorp and can't be viewed online, but can be downloaded and viewed offline with what is known as a GIF file-viewer program.

AOL's biggest disappointment was that during "prime-time" evening hours, it sometimes responds very slowly to almost any command. A victim of its own success and quick growth, AOL has experienced problems with meeting expanding demand, but efforts are under way to remedy this.

Your first 10 hours on AOL are free.

Your first 10 hours on AOL are free. After that, it costs $9.95 per month for five hours, and $3.50 per hour beyond that. There's no per-message charge for e-mail. To receive a free AOL front-end software kit, call (800) 827-6364.

Online Services Summary

	America Online (800) 827-6364	CompuServe (800) 848-8199	Delphi Internet (800) 695-4005	GEnie (800) 638-9636	Prodigy (800)-PRODIGY
Model airplane discussion and message base	Part of R/C discussion base	ModelNet: active and extensive	Internet Newsreader for rec.models.rc"	Modeling RoundTable	Part of R/C discussion base
Online flight simulator	None	None, but can play Falcon 3.0 and MiG 29 via H2H modem	None, but can play any H2H	Air Warrior online, multiplayer modem game	None
Flight simulator discussion message base	Yes	Very active, also modem games discussion	No	Very active Air Warrior message base	Yes
Weather maps, satellite photos	Extensive	Extensive	Extensive (via Internet)	Rudimentary	Basic
Local weather forecasts	Large cities only	Extensive and detailed	Extensive (via Internet)	None	Large cities only
Remote weather forecasts	Large cities only	Extensive and detailed	Extensive (via Internet)	Partial information	Large cities only
Internet services	E-mail only, expansion announced	E-mail only	Full, including Gopher, FTP, Telnet and Newsreader	E-mail only	E-mail only
Text or graphic user interface	Graphic only	Text or graphic	Text only	Text only	Graphic only

Additional Publications

If you're interested in the developing world of cyberspace, but are looking for more detailed information, these publications and books will be of interest:

- **BBS—BULLETIN BOARD SYSTEMS MAGAZINE**
  Richard W. Robinson, Editor-in-Chief
  Caller's Digest Inc., 701 Stokes Rd., Medford NJ 08055; (800) 822-0437.

- **BOARDWATCH MAGAZINE**
  Jack Rikard, Editor
  Ste. 210, 8500 W. Bowles Ave., Littleton, CO 80123; (800) 933-6038.

- **COMPUTER SHOPPER**
  John Blackford, Editor
  Ziff Davis Publishing Co., One Park Ave., New York, NY 10016; (212) 503-3500.

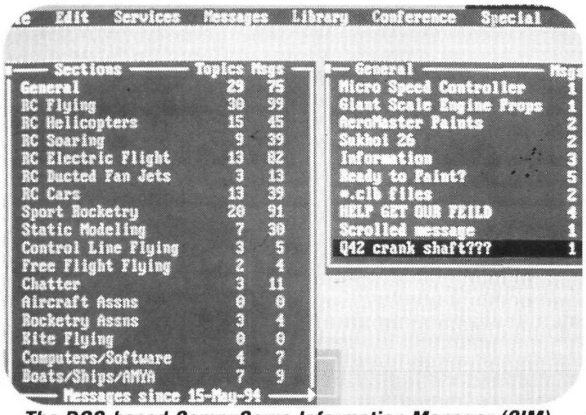
- **INTERNET WORLD**
  Daniel P. Dern, Editor-in-Chief
  Meckler Corp., 11 Ferry Ln. W., Westport, CT 06880; (203) 226-6967.

- **ONLINE ACCESS**
  Kathryn McCabe, Editor-in-Chief
  Chicago Fine Print Inc., Ste. 310, 900 N. Franklin, Chicago, IL 60610; (312) 573-1700.

- **"THE COMPLETE HANDBOOK OF PERSONAL COMPUTER COMMUNICATIONS:** Everything You Need to Go Online with the World," by Alfred Glossbrenner, St. Martin's Press, New York, 1985.

- **"THE INTERNET COMPANION: A BEGINNER'S GUIDE TO GLOBAL NETWORKING,"** by Tracy LaQuey with Jeanne C. Ryder, Addison-Wesley Publishing Co., Reading, MA, 1993.

- **"INTERNET BASICS: YOUR ONLINE ACCESS TO THE GLOBAL ELECTRONIC SUPERHIGHWAY,"** by Steve Lambert and Walt Howe, Random House Electronic Publishing, New York, 1993.



The DOS-based CompuServe Information Manager (CIM) conveniently displays the ModelNet Forum sections and topics.

CompuServe Information Service

CompuServe Information Service (CIS), in operation since 1969, offers an extensive selection of 1,400 topics and interest areas. CIS can be accessed with your own telecommunications software or with the CompuServe Information Manager (CIM), which is available as a colorful text front end or in a Windows version.

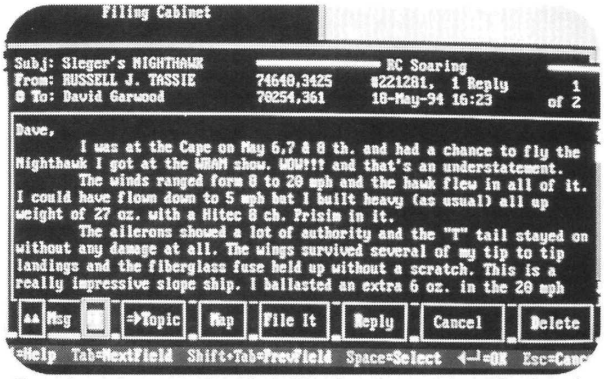
The ModelNet discussion forum, moderated by Doug Pratt, is the most active of any such forum on the five major services. It contains R/C discussion bases on general flying issues, helicopters, sailplanes, electrics, and ducted fans, and includes additional areas on control-line flying, model rocketry, computers and software, and more. Any one of these subject areas has a large "table of contents" of ongoing discussions. The Academy of Model Aeronautics maintains a presence on ModelNet, as do Ace R/C, Northeast Sailplane Products, Soaring Stuff, SR Batteries and Tower Hobbies. ModelNet also has an extensive offering of modeling files, including AMA club listings, CAD drawings and configuration files for R/C flight simulators.

Extensive weather information available on CIS includes National Weather Service forecasts for every county in the U.S. (3,000 locations) and many foreign cities, plus the NWS statewide three-day forecasts, and aviation weather reports and forecasts. CIS offers satellite photos and AccuWeather, as well as national and regional maps, up to two days in advance (but not isobar maps). The satellite photos and maps can be viewed online or downloaded.

CIS has no resident online flying games, but it does support head-to-head combat between players using their own PC flight-simulator software. CompuServe acts as the modem connection for modem-playable games and maintains Spectrum Holobyte's *Falcon 3.0* and *MiG-29* contest ladders. CIS supports extensive discussion areas on flight simulators, air-combat games and space-combat games.

CompuServe has more of nearly everything than any other service, and it's the first to eliminate a surcharge for daytime access. CIS costs $8.95 per month for unlimited access to basic services, plus $4.60 per hour for extended services. The first 30 e-mail messages are free, and additional ones cost 15 cents each. Call (800) 848-8199, or visit a software store for a new-member sign-up kit.

The CompuServe ModelNet Forum has made a special offer to *Model Airplane News* readers: call (800) 524-3388 and ask for representative 169. You'll receive a free Intropak that includes a free month's subscription ($8.95) and a $15 usage credit toward the Plus Services, which include the ModelNet Forum.



Sample message in the ModelNet Soaring section, displayed in the DOS CompuServe Information Manager (CIM) front end. CompuServe can also be accessed with a plain-text communications program or a Windows-based CIM.

While GEnie's text interface for most data looks plain, their resident online, multi-player games definitely do not. Air Warrior is one of 15 multi-player games available.

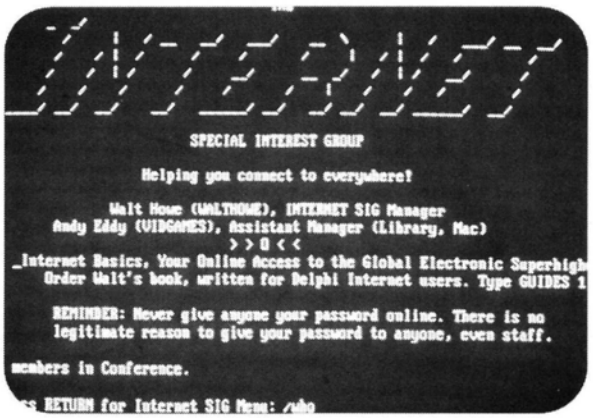
GEnie

GEnie's rapid-fire text interface offers the user an amazingly wide reach to informational databases and the most extensive online gaming of all the OISs. The Modeling RoundTable, moderated by Paul Arildsen, offers comprehensive coverage of modeling. The R/C model aviation category includes downloadable files and discussion topics on industry news, construction techniques, scale modeling, engines and motors, helicopters, sailplanes and electric flight.

The EAASY SABRE airline flight-information system provides brief current weather statements and two-day forecast information for 700 U.S. and Canadian cities and 125 cities around the world, but it's limited to temperature and sky conditions; no wind information is available.

GEnie's showpiece is Air Warrior, the premier multi-player air-combat simulation game, covered in the August '94 *Model Airplane News.* GEnie costs $8.95 per month plus $3 per hour for evening online time. There is no per-message charge for e-mail. You can sign up for GEnie online with a credit card and your own communications program, or call (800) 638-9636 for an information packet.

Delphi Internet



Stark but powerful: this screen leads you to the amazing world of the Internet on Delphi Internet.

The Delphi Internet is a tiny powerhouse. Smallest of the major services, it offers advanced capabilities that aren't available elsewhere. The starkness of its text-based user interface is offset by its speedy operation and long reach to other computers for manifold services.

Delphi Internet provides full Internet access that goes beyond the e-mail available on other OISs (including Gopher, Newsreaders, FTP, WAIS, World Wide Web and Telnet). With these tools, you can locate and download a large variety of files from thousands of computers worldwide.

Although Delphi Internet's hobby discussion base doesn't include R/C aircraft, it does provide the capability to set up your own forum (essentially a private BBS), in which access is limited to those who are given a password. Members of an R/C model club could have a private forum, providing an alternative to setting up and maintaining a local BBS.

Delphi Internet's Newsreader access to the Internet "rec.models.rc" message base provides a steady stream of information on all forms of R/C activity, including airplanes, sailplanes, boats and cars. The geographic diversity of contributors is amazing; in one recent session on the Newsreader, I saw messages from Australia, England, Germany, New Zealand, South Africa and the USA.

Delphi Internet's weather information comes through its Internet connections. The Weather Gopher has 44 reports available, including radar summaries and forecasts, satellite and weather images, and marine coastal advisories. The Usenet reader provides access to the Internet meteorology message base. The Internet Telnet function allows you to log on to weather-information computers at universities in the U.S. and in other countries, and if you're wondering how best to use these resources, you can get help from the Weather Watchers On-Line discussion base.

Delphi Internet supports the capability to play *any* head-to-head modem game (e.g., *Falcon 3.0)* online against a live opponent. Delphi Internet recently purchased The Kesmai Corporation, publisher of the *Air Warrior* online multi-player game (see the August '94 issue of *Model Airplane News*). At the time of this writing, the schedule for offering Kesmai games on Delphi Internet had not been announced.

Delphi Internet costs $10 per month for four hours, $20 per month for 20 hours plus $3 per month for Internet access. There is no per-message charge for e-mail. You can become an instant Delphi Internet member with a credit card and your own communications software. For more information, call (800) 695-4005.

Delphi Internet offers five hours free to *Model Airplane News* readers (although the first month's fee is not waived). To receive the five-hour free trial, dial (800) 365-4636 by modem, press "Enter" one or two times, and at the password prompt, type "MAN9410." The offer applies to new members only. A valid credit card is required for immediate access. Online restrictions apply. Complete details are provided during the toll-free registration. Questions? Call (800) 695-4005 or send e-mail to "INFO@delphi.com."

Model-Related Electronic Bulletin Board Services

These BBSs are run by model airplane clubs, manufacturers, or dedicated hobbyists for the purpose of making model aviation information more accessible. All are public in the sense that they encourage new people to sign on. All operate 24 hours at 8 data bits, no stop bit and 1 check bit (8-N-1). Shown is the highest baud rate supported at the time I called the boards.

AERODATA BBS
(313) 944-0822
Baud rate: 14,400
Sysop: Randy Anderson
20 sub boards, magazine article database

SOUTH BAY SOARING SOCIETY BBS
(408) 281-4895 Baud rate: 9,600Sysop: Rick Rolfing
R/C soaring information, weather

SLOPE-TECH BBS
(714) 525-7932
Baud rate: 2,400
Sysops: Wes Parson, Bob Reynolds
Extensive California slope-site listings

TEHACHAPI BIRD'S NEST BBS
(805) 822-5434
Baud rate: 14,400
Sysop: Scott Metze
R/C soaring, weather, mountain biking

THE HANGER
(714) 740-0551
Baud rate: 57,600
Sysop: Timothy Cardin
Nine message bases, on-line club newsletters, aircraft GIF files and long BBS list

THE R/C CHAT BOX
(614) 575-8012
Baud rate: 14,400
Sysops: John Markham, Larry Tabor
R/C building, flying and discussion

BOARDWATCH MAGAZINE BBS
(303) 973-4222
Baud rate: 14,400
Sysop: Jack Rikard
BBS numbers and BBS information

BOBsBBS
(916) 929-7511
Baud rate: 9,600
Editor and Sysop: Bob Breedlove Home of the Darwin U.S. BBS list, in June '94, list number 121 had 3,573 BBSs listed

THE INTERNET

Sometimes called the information superhighway, the Internet is a global community of computer users and an abundant source of information, news and electronic conversation. A network of networks, the Internet links a million and a half computers—from the latest supercomputers to tiny palmtop machines. An estimated 35 million users presently tap into the Internet, and system use grows at an estimated 12 percent each month.

Of particular interest to airplane modelers are the "rec.models.rc" Newsgroup, the Gopher weather services and the global e-mail. My own Internet e-mail correspondents include a sailplane modeler in Germany, a slope-soaring enthusiast in California, a soaring writer in New Jersey and the staff at *Model Airplane News*. The perspective of modelers from other countries is informative and refreshing.

Instructions for Internet use are beyond the scope of this article and are the subject of several excellent books. E-mail, the most widely used Internet service, is provided by all of the online information services and some BBSs. Although Delphi Internet is the first OIS to offer *full* Internet capabilities, the other major services are working to add more robust Internet capabilities. Your Internet access begins with an account with one of the online information services, a local Internet link service vendor (they advertise in many newspapers), or a large BBS.

Online Service Evolution

In cyberspace, "nothing is constant but change." BBSs go in and out of business, software becomes more capable, modems get faster and less expensive, online services add features and capabilities, and costs keep going *down*.

Unlike phone service and cable-TV service, the online information providers generally don't have start-up charges, and the first month is often free. You pay for as long as you like what you get, and can quit in a minute when it's not beneficial and cost-effective for you. I hope you have enjoyed this brief tour of cyberspace resources for modelers. If you would like to see more articles on how computers can be used in modeling, send me e-mail at "70254.361@compuserve.com."

[Editor's note: Let us know your thoughts, too! The editors of Model Airplane News can be reached at these Internet addresses: Tom Atwood—toma@airage.com. Frank Masi—frankm@airage.com.; Julie Soriano—julies@airage.com.; Chris Chianelli—chrisc@airage.com.; and Gerry Yarrish—gerryy@airage.com. We look forward to hearing from you.] ■

1935 KG-2 with Joe Kovel and Norm Rosenstock.

C.U. Brown Jr. engine with ancient mechanical timer.

R/C-ASSIST CONTESTS AND NOSTALGIC MEETS

FOR ANYONE WHO's interested in flying model airplanes, a visit to a typical old-timer contest is like happily traveling more than half a century back in time. There are many excellent examples of early gasoline-powered models, and the atmosphere is almost always one of camaraderie. Most of the participants are middle-aged and older men—some of whom were actually there when it all began in the 1930s.

1938 Record Hound and legendary champion Henry Struck.

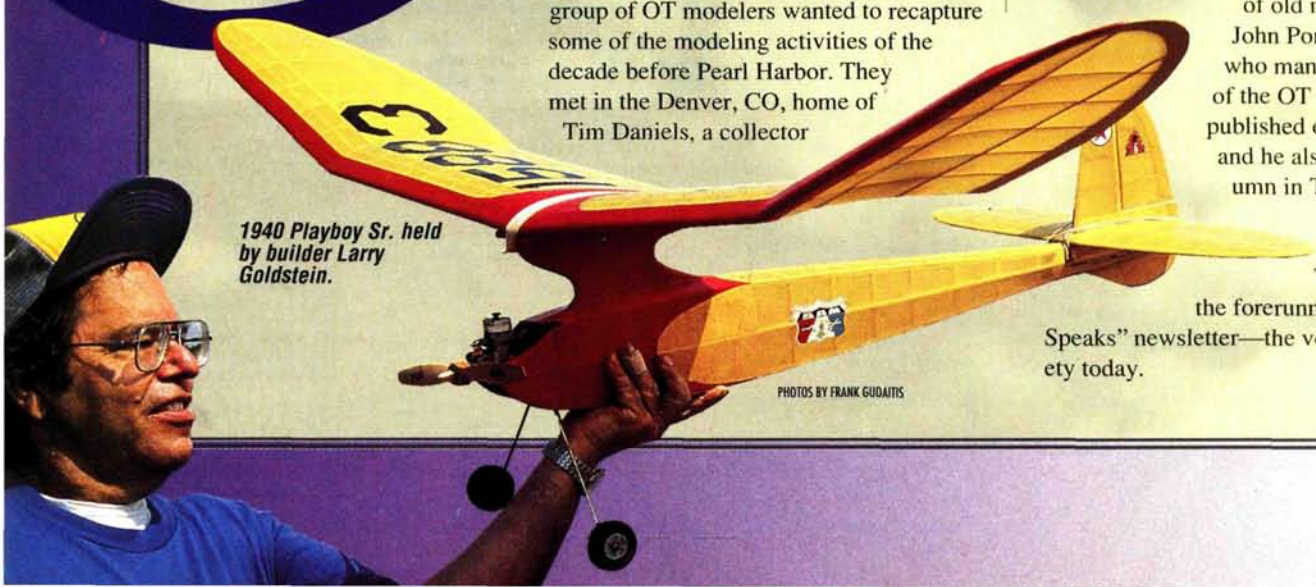
Society of antique modelers

by FRANK GUDAITIS

THE GROWTH OF SAM

The Society of Antique Modelers (SAM) came into being in 1966, when a small group of OT modelers wanted to recapture some of the modeling activities of the decade before Pearl Harbor. They met in the Denver, CO, home of Tim Daniels, a collector of old model engines. He had a model engine museum in his basement, and he published a newsletter for other collectors of old model engines.

John Pond, the man who many call the father of the OT movement, published old model plans, and he also wrote a column in Tim's little engine newsletter. This column was the forerunner of the "SAM Speaks" newsletter—the voice of this society today.



1940 Playboy Sr. held by builder Larry Goldstein.

PHOTOS BY FRANK GUDAITIS

Six months after their first meeting, the first SAMCHAMPS contest was held a few miles east of downtown Denver at a tiny airport in Aurora. The meet was attended by roughly 150 "true believers" from many parts of the country who wanted to re-create a model contest that was like the prewar nationals.

1935 KG-2 carried by original builder Joe Kovel.

Twenty-seven years later, that small group has grown into an international organization with more than 2,800 members and 113 chapters on the North American continent. There are 20 overseas chapters with 1,800 members who span the globe from England to Australia. The newest overseas SAM chapters are in Hungary, Czechoslovakia and South Africa.

A WORLD VIEW

Jim Adams, president of SAM North America, writes, "We have tried to keep the organization as relaxed as possible and have insisted that each of the overseas chapters fly their old-timers as they themselves remember modeling. Consequently, you'll find that the English fly mostly rubber- and diesel-powered models, and the Germans, Czechs and many other European groups fly old-time slope gliders. Australia was influenced mainly by John Pond's visits, and they fly mostly R/C-assist-type old-timers—John's favorite. The Italians favor their country's old-time designs, as do the Swedish and the French. This invitation to each group to do their own thing as they remember their early modeling has made the SAM movement very popular overseas."

At international SAM contests, OT'ers from other countries show up to fly as invited guests of a local chapter, and once a year, the national SAMCHAMPS are held in various parts of the USA. This gives most members an opportunity to attend a big meet once in a while. Even local meets attract OT competitors from distant states. The OT models shown in this article were photographed on Long Island, NY. Some of

View of pit area with Florida resident Herb Walters.

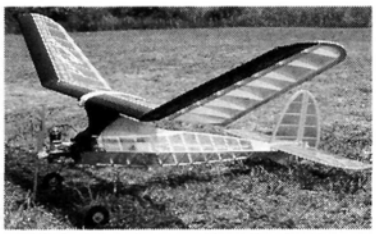
1936 Dallaire Sportster

OT Thinking

The altruistic aims of the SAM organization are very eloquently summed up in the following. When OT'er Chester Lanzo passed away, John Delagrange wrote these words as part of a moving eulogy to Chester's memory: "I would ask all SAM members everywhere to stop, think and make this promise of honor to Chester Lanzo. I resolve to:

- **Reread the SAM preamble and conduct my modeling endeavors in its true spirit.**
- **Support, rather than criticize.**
- **Contribute, rather than take.**
- **Encourage, rather than discourage.**
- **Make a friend, rather than an enemy.**
- **Negotiate rules, rather than argue them.**
- **Help your fellow modelers, rather than hurt them.**
- **Participate in meets to enjoy the gifts of life and friendship.**
- **Put fun and fellowship ahead of winning prizes and trophies."**

1942 Brooklyn Dodger designed by Sal Taibi.



1938 bomber designed by Chester Lanzo.

1941 Super Quaker (Megow kit)

1936 Miss America

1936 Dallaire Sportster

1938 Anderson pylon powered by antique Forster 99.

1938 Standby

1936 Dallaire Sportster

their owners/builders brought them from as far away as Florida and Canada.

FLYING HISTORY AT THE 5TH ANNUAL MEET

The regional meets attract several illustrious pioneer model airplane designers and builders. Joseph Kovel and his historic KG (Kovel-Grant) and Henry Struck and his '38 Record Hound came to the fifth annual Long Island meet. (There were actually three examples of the Record Hound at this meet.) Henry Struck can accurately be called a world-class champion modeler. Looking back over his 77 years, one finds a prolific career of designing and building many successful miniature aircraft. Besides winning many contests and setting many records, 48 of his models were manufactured in kit form by the Berkeley Co., and eight of his original designs were published in *Air Trails*, 16 in *Flying Aces*, and 10 in *Model Airplane News*. Henry was also a project member in the development of full-scale aircraft designs and innovations, including work on the CG4A troop-carrying glider.

Joseph Kovel and his KG will always have a distinguished place in the history of model aviation. In 1934, when he was 19 years old, his original KG was the first inherently stable free-flight powered model. It was designed by aeronautical engineer Charles Hampson Grant, who was also one of *Model Airplane News*' early editors. Today, the original is displayed in a place of honor at the AMA museum. The highlight of this meet was seeing a KG fly.

MODERN ANTIQUES

At any SAM gathering, you'll see many models designed by famous OT'ers, such as Carl Goldberg, Dick Korda, Sal Taibi, Lou Garami, Ben Shereshaw and Chester Lanzo. Although they were almost always intended to be free-flight models, lack of wide-open spaces in some areas has made it necessary to equip these SAM OT'ers with "radio assist" control. This modern intrusion on the purist free-flight spirit hasn't significantly dampened the enthusiasm of SAM members who live near large urban areas. Those who fly with old spark-plug ignition engines can now avail themselves of transistorized ignition systems that will suppress RF interference from the spark plug to their sensitive R/C receivers. Another modern-day feature is an onboard beacon transmitter that sends out a homing signal to help locate a lost model.

Although most OT models are powered by internal-combustion engines, many enthusiasts fly replicas of early rubber-band-powered models. Even the relatively new electric motors are popular with builders of these models of yesteryear.

SAM welcomes those of you present-day model builders who might wish to join in the fun of OT flying; many of the members will help you to get started. Plans for many of these OT'ers are still available from John Pond and other sources listed in the accompanying sidebar. *Model Airplane News* even has the pioneering KG plans (no. FSP04351)!

If you'd like to join the Society of Antique Modelers, contact Mrs. Bob Dodds, 209 Summerside Pl., Encinitas, CA 92024.

This writer is indebted to contest director and three-time national SAM-CHAMPS winner Larry Davidson for much valuable help in writing this article.

■

New Old Stuff

OT KITS AND PLANS

Henry Klarich, (kits), 2301 Sonata Dr., Rancho Cordova, CA 95670.

Hobby Horn, (kits), 15173 Moran St., P.O. Box 2212, Westminster, CA 92684.

John Pond, P.O. Box 90310, San Jose, CA 95109.

Ken Sykora's Old Timer Model Supply, P.O. Box 7334, Van Nuys, CA 91409.

NEW "OT" ENGINES

Argo USA, 3229 Diandra Dr., Palos Verdes Peninsula, CA 90274.

Larry Jenno, 4341 Flandes St., Las Vegas, NV 89121.

Marvin Miller, 250 Branco Rd., Soquel, CA 95073.

MECOA, P.O. Box 80830, San Marino, CA 91118.

Shilen Aero Sports, P.O. Box 1300, Ennis, TX 75120.

Super Cyclone Engines, P.O. Box 1809, Show Low, AR 85901.

ENGINE PARTS AND ACCESSORIES

Larry Davidson, 1 Salisbury Dr. N., East Northport, NY 11731.

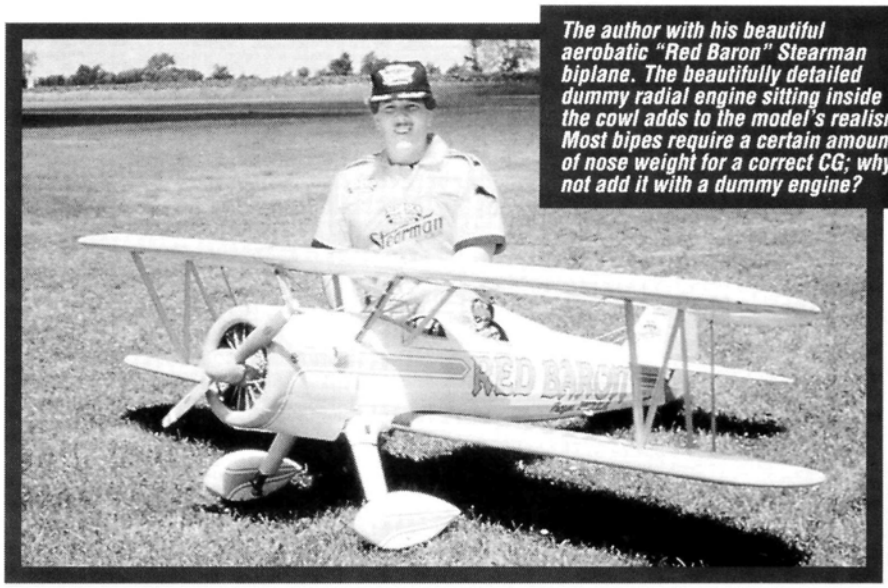
Micro Model Engineering, 1301 W. Lafayette St., Sturgis, MI 49091.

Vic Didelot, 4410 Lorna Ln., Erie, PA 16506.

Filling the cowl with class!

HOW TO Make Dummy Radial Engines

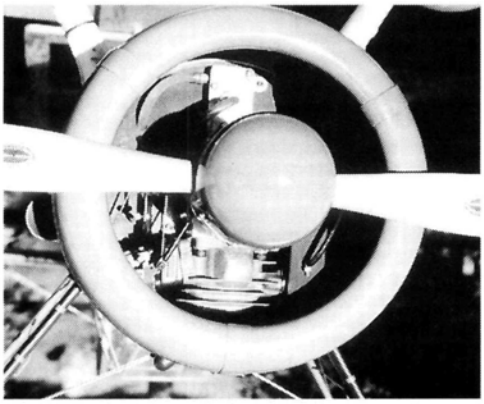
by JIM SANDQUIST

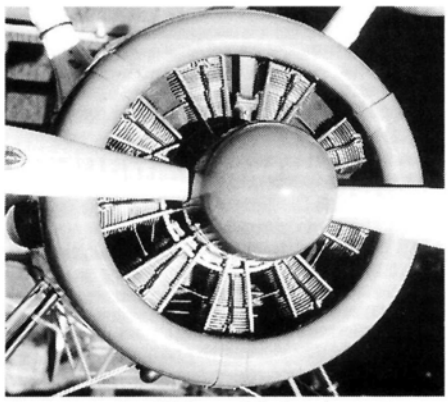


The author with his beautiful aerobatic "Red Baron" Stearman biplane. The beautifully detailed dummy radial engine sitting inside the cowl adds to the model's realism. Most bipes require a certain amount of nose weight for a correct CG; why not add it with a dummy engine?

PHOTOS BY JIM SANDQUIST

"MOST OF US know that real airplanes have round engines!" With all the new AT-6, Sukhoi, Stearman and Waco kits on the market today, it's a shame to have the front of the cowl wide open. A round engine up front really sets a model apart from those without, but those round engines can sometimes be a real problem to replicate when it comes to our models. This need not be the case. Many good sources provide dummy engines and, with a little effort, you can make that large empty space in the front of your plane into a real eye-catcher.





These photos show what a big difference a dummy engine can make. With careful planning and a simple baffle plate, engine cooling usually isn't a difficult problem to solve.

FRANK'S JUGS

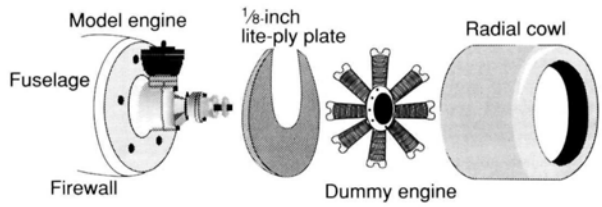
Dummy engines are available in sizes from 1/6 to 1/3 scale, and prices range from $12 to $35. Frank Tiano of FTE* makes one of the most intricate that I've found on the market. His resin-cast engine plugs are heavier than vacuum-formed engines, but they do offer much greater detail. Vacuum-formed engines hardly add any weight to the aircraft and are a bit easier to mount, but they're more difficult to detail.

After you've chosen your dummy engine, you'll need a good photo or drawing of the engine that you're replicating. Engine photos can be found in a number of places. A stop at a local airport can often reveal a plane with the engine you need, or the engine manufacturer may be willing to send drawings. The library or the book section at a local hobby shop may also have good documentation photos. Even if you aren't able to find a photograph of the engine you need, you can still dress up the front of your plane with a generic-looking engine.

AIRFLOW

Before I begin explaining the actual engine detailing, a discussion on airflow and engine cooling is in order. Have you ever wondered, "How can an engine stay cool when so much of the frontal area is blocked off?" When you enclose an engine in a tightly cowled situation or when you put a dummy engine in front of it, you need to create a draft or venturi effect across the engine head. This is accomplished by having an opening in front of your engine for the air to come into and then creating an air exhaust that's approximately twice the size of the air intake. This ratio of one part air in to two parts air out will keep sufficient cool air flowing across the head of your engine.

Figure 1 DUMMY ENGINE & COWL ATTACHMENT DETAILS



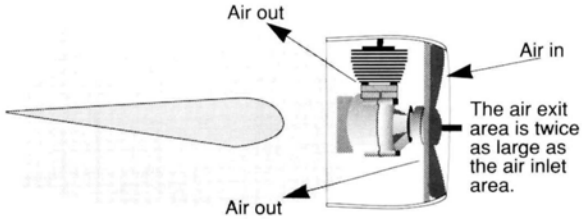


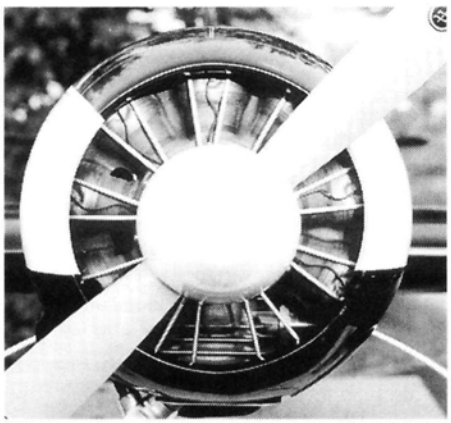
Figure 2 ENGINE COOLING AND AIRFLOW

You may find that your enclosed engine will require a slightly richer mixture than if it was totally exposed to outside air. In a round cowl, you may want to cut a piece of 1/8-inch-thick lite-ply plate to fit inside the cowl and cut an opening in it for the air to flow through. This plate will also act as a surface on which to mount your dummy engine (see Figures 1 and 2 for details).

Before you paint and detail the dummy engine, be sure to cut it to the radius that fits your cowl. In most situations, the radial-engine cylinder heads are covered by the cowl, so you'll probably need to cut the top portion of your dummy engine for it to look true-to-scale.

DETAILING

Now that your engine fits in the cowl, you can begin to paint and detail it. K&S* tubing works really well to replicate the aluminum pushrod tubes on the engine. This tubing can also be used to form a collector ring like

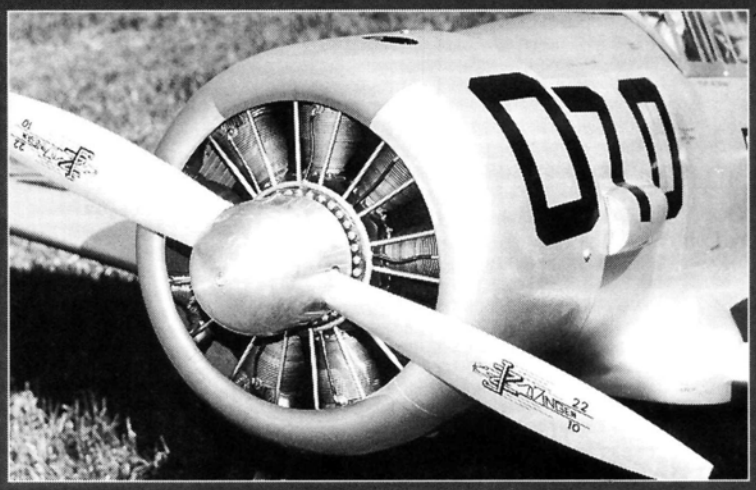


The vacuum-formed dummy engine (installed in the author's Sukhoi) is a quick way to add detail to the otherwise empty nose. Notice the model engine at the bottom.

those used on the Pratt & Whitney R985 engines. Look in the railroad-supplies section at local hobby shops for miniature hex-head bolts, washers and nuts (they're also available from Micro Fastener*). Light-gauge wire will work well for spark-plug wires. If you want to make small spark plugs, this can be done quickly and easily by chucking a small-diameter hardwood dowel in a drill press, and then using a small triangular pattern file to turn the shape of the plug head. After you've determined how much detail you're going to do, drill all the appropriate holes for the pushrod tubes, nuts, bolts, spark plugs and wire. You're now ready to begin painting.

Scale Specialties Cylinders

by Gerry Yarrish



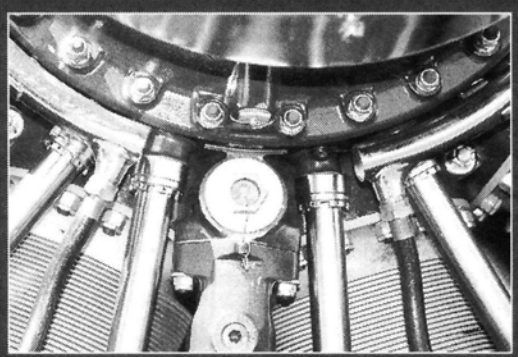
Scale Specialties offers highly detailed, resin-cast dummy radial engine cylinders. Here, the realism of associate editor Gerry Yarrish's Bridi SNJ-6 is greatly enhanced.

Another very good source for dummy radial engine cylinders is Scale Specialties* of Phoenix, AZ. These black cylinders are available individually, are resin-cast in halves (front half detailed, rear face flat) and have a very high degree of scale detailing. All the cylinder cooling fins are cleanly molded, and the cylinder tops are detailed with rocker covers and sub-cooling fins. The bases of the cylinders have a circular lip that has finely detailed cylinder attachment bolts and nuts already molded in. You can duplicate an attractive, accurate, Pratt & Whitney radial by attaching the dummy engine to a scratch-built crankcase.

This detail of the full-size Pratt & Whitney radial engine (in a restored SNJ-6) shows the beauty of these big powerhouses.

PRATT & WHITNEY COLORS

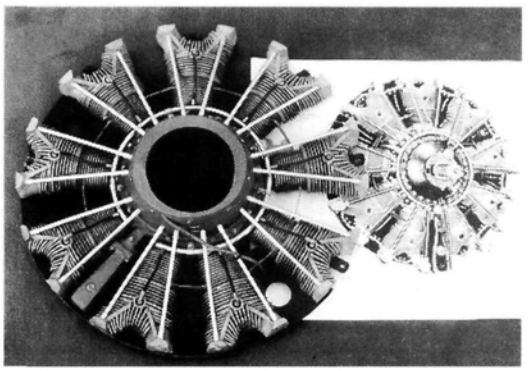
In researching my SNJ-6, I went to the South Philadelphia Airport and took many photos of the full-size SNJ-6 owned by Dr. Joseph Scogna for my documentation package. The big Pratt & Whitney 600hp R-1340-AN-I engine was as spotless as the rest of the aircraft. The colors of the engine are striking and very bright—not at all dull or dirty. The crankcase is a dark cobalt blue, and the cylinders are a heat-tarnished, slightly golden honey color over a shiny magnesium silver. The pushrod tubes in front of the cylinders are chrome-plated, as is the collector ring around the front of the crankcase. One of the interesting details of the big radial is that there's an oil sump with a drain plug in its front surface in the front lower center (between the two lowest cylinders). A shiny penny is in the center of this plug. When the engine is overhauled, to record the date, a new penny is placed in the recessed front of the plug before the drain plug is safety-wired into place.



The oil sump is positioned between the two lowest cylinders. Notice the penny in the oil sump drain plug.

Most pilot/owners of full-size antique aircraft go to great effort to restore their aircraft. In most cases, the planes look better than when they first rolled out of the assembly hangar. Check out a warbird rally; you'll be surprised at how beautiful those old radial engines can be.

MAKE A DUMMY ENGINE



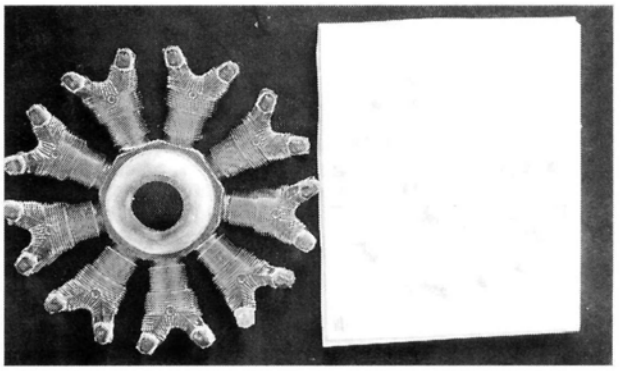
Here you see a painted, detailed, FTE, resin-cast dummy engine that's ready to be installed in the model's cowl. The illustration in the background was used as a painting guide.

Your choice of paint is going to vary depending on the equipment you have. If you have an airbrush, you should be able to get a more realistic, "weathered" look than if you use paint from an aerosol can, but either method will provide good results. When you choose colors, remember that most engines are painted in gray, black, or aluminum. Even newly built engines are finished in these colors. Model Master paints from Testors* work really well with an airbrush. They're fuelproof, come in a variety of shades and colors and are labeled with the U.S. Federal Standard numbers for those of you who are working toward scale competition.

RADIAL COLORS

Painting the crankcase first seems to work best. This will usually be gray or black. Then you'll need to mask it off so that you can paint the cylinders. You'll paint the cylinders three times. First apply a base coat of flat black. When this is dry, apply an aluminum-colored paint. Take care not to put on too much of the aluminum because you want some of the black to show—particularly in the space between the cylinder fins. To give the cylinders a three-dimensional look, use a small brush and chrome paint to highlight the edges of the cylinder fins. These highlights should be placed randomly around the fins. After all the parts have dried, do the final assembly of the engine components.

The assembled engine will have a more realistic look if you weather it a little. This is best achieved with an airbrush and a gray wash. Mix four parts of thinner with one part of flat black paint to make the wash, then use an airbrush to spray a light wash at the base of the pushrod tubes, in the crevices of the crankcase and anywhere dirt and oil might accumulate. If you've used miniature bolts and nuts, eliminate the shiny look by using a paintbrush to dab the wash on the hardware.



Dummy engines come in two forms—resin-cast (left) and vacuum-formed. The resin-cast engine is from FTE, and the vacuum-formed example was picked up at the Toledo Hobby Show.

The only thing left to do is to install the engine in the cowl. Glue the dummy engine to the plywood plate, and attach the assembly with silicone, Model Magic* Epoxy Plus, or Zap-A-Dap-A-Goo*. Any of these will work well to hold the assembly in place. With a little modification, you can also use screws to hold the assembly in place; this allows it to be easily removed.

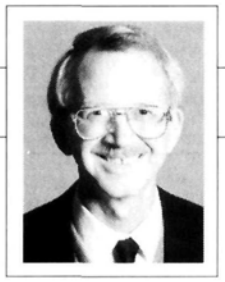
Take the time and effort to put in a dummy radial engine. You'll get high praise from fellow fliers, and your plane will stand out from the crowd!

Dummy Engine and Cylinder Manufacturers

- **FRANK TIANO ENTERPRISES**
15300 Estancia Ln., W. Palm Beach, FL 33414
(Resin-cast)
- **GREAT PLANES MODEL DISTRIBUTORS**
P.O. Box 9021, Champaign, IL 61826-9021
(Vacuum-formed)
- **INNOVATIVE MODEL PRODUCTS**
P.O. Box 4365, Margate, FL 33063
(Vacuum-formed)
- **LANIER RC**
P.O. Box 458, Oakwood Rd., Oakwood, GA 30566
(Vacuum-formed)
- **NICK ZIROLI MODELS**
170 Oval Dr., Central Islip, NY 11722
(Vacuum-formed)
- **RICH URAVITCH**
15 Newcomb Trail, Ridge, NY 11961
(Vacuum-formed)
- **SCALE SPECIALTIES**
P.O. Box 50791, Phoenix, AZ 85076
(Resin-cast)
- **WILLIAMS BROTHERS**
181 Pawnee St., San Marcos, CA 92069
(Injection-molded plastic)

Addresses are listed alphabetically in the Index of Manufacturers on page 121. ■

ELECTRICS



MITCH POLING

EVALUATING YOUR MOTOR

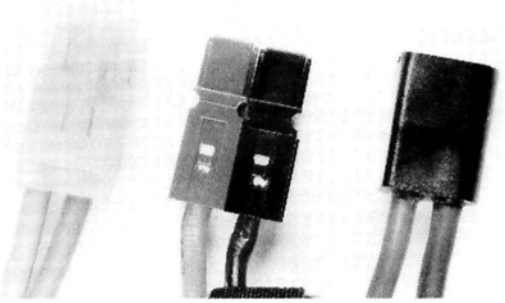
PHOTOS BY WALTER SIDAS

Motors are available in a variety of sizes and types. Some use cobalt magnets; some use ferrite; there are even brushless motors. Regardless of its type, if you know how to evaluate your motor's performance, you'll be able to enhance your model's flying capabilities.

MY ARTICLE ABOUT gearing and its advantages for high-power applications appeared in the February '94 issue of *Model Airplane News*. As a background, I included a sidebar on the motor equations I used to show the gain in performance that's possible with gearing. Much to my surprise, I got a big response to this article, with some very good questions about the details involved in the use of the equations. Many had tried to use the equations and had come up with numbers that differed from mine. A tip of the hat to *Model Airplane News* readers; they are sharp! The article was about gearing, not motor evaluation, so I didn't go into details about the equation setups. Now I know better! In answer to your many questions, here are the full details on the practical setup and use of these equations.

WHAT IS TERMINAL VOLTAGE ?

The equations in the article use the *motor terminal voltage (Vt)*. This can be measured directly at the motor terminals with a voltmeter, but it's usually more convenient to work with the number of cells in the battery pack and calculate Vt. The voltage of the unloaded battery pack is 1.25 volts per cell. As an example, a 6-cell pack would have an unloaded voltage of 7.50 (6 x 1.25 volts). This voltage is the *unloaded battery voltage (Vb)*, not Vt. To get Vt, we have to take into account the losses in a real model airplane power system between the battery pack and the motor terminals.



Did you know that connectors could rob your system of precious power? The Tamiya-type connector (left) has considerably more resistance than the Sermos (middle) or Astro Flight Zero Loss (right) connectors.

The battery pack has internal resistance, and so do the wiring, speed controller, connectors, switches and fuses. These losses have to be calculated to arrive at the value of Vt. This is where the readers had a problem. I had not mentioned these losses or what their values might be. Whoops! Let's remedy that right now!

CUTTING YOUR LOSSES

First, the battery pack. A pack's resistance will depend on how the cells have been made, their capacity and the connectors between them. A pack made of Sanyo* 1400 SCR cells with the usual welded-steel connector straps will have a resistance per cell of about 0.012 ohm. If the steel straps are replaced or bypassed by soldered copper wire or copper straps, the resistance drops to about 0.008 ohm. It pays to use copper!

Smaller cells have a higher resistance. A rough rule of thumb is to scale the values I just gave using the ratio of the mAh capacity of the larger cells divided by the mAh capacity of the smaller cells. If you know that 1400mAh cells have a resistance of about 0.012 ohm per cell, you can determine the resistance of smaller, 700mAh cells by dividing 1400 by 700 then multiplying by 0.012. The result is 0.024 ohm per cell. This is not all of the story; SCE cells have a higher internal resistance than SCR cells, and other brands may have a higher resistance than Sanyo cells, but this method will do for a start.

Wiring losses are as follows:

- 14-gauge, high-flex wire has a resistance of 0.0002 ohm/inch;
- a 30A, plastic-body automotive fuse—0.003 ohm;
- Sermos* and Astro Flight* connectors—about 0.0004 ohm per connection.
- Tamiya-type steel connectors—0.0015 ohm per connection. That's four times more resistance than Sermos connectors. In fact, the resistance in a Sermos connection is almost the same as for an equivalent length of wire, i.e., it's a nearly "loss less" connection.
- A good high-rate speed controller, such as those from Jomar* and Astro—about 0.005 ohm.

• A low-cost frame-rate speed controller—about 0.02 ohm (four times more resistance than the Astro or Jomar).
• A toggle switch—about 0.001 ohm.

CALCULATING TERMINAL VOLTAGE

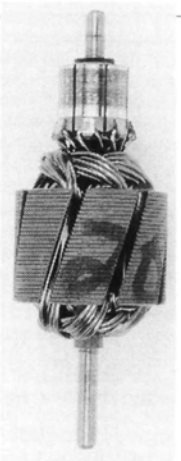
Now we are ready to calculate Vt! Add up all the resistances in the system you're using, multiply that figure by the current the system is operating on, and subtract this from Vb (the battery's no-load voltage).

• **Example:** a system that uses a 6-cell pack of 1400 SCR Sanyos, a low-cost frame-rate speed controller, 18 inches of 14-gauge wire, four Tamiya connections (battery pack to speed controller; speed controller to motor), a toggle switch, and a 30A fuse, would have a *total resistance* of:

6 x	0.012	Battery no-load voltage
	0.02	Speed controller
18 x	0.0002	Wire resistance
4 x	0.0015	Connector losses
	0.001	Toggle switch
	0.003 ohm	(fuse)
Total	0.106 ohm	(to three digits)

At full power, a low-cost system like this one will usually run at 15 amps or less. At 15 amps, the wiring voltage loss (Vw) will be 15 x 0.106 = 1.58 volts. Subtract Vw (1.58 volts) from Vb (7.5 volts) to get the motor terminal voltage (5.92 volts). This is a substantial loss between the battery pack and the motor.

Higher-quality systems with Sermos connectors, copper battery straps and high-rate speed controllers will usually have a wiring resistance of 0.068 ohm or less. In the example just given, that would mean a Vt of 6.5 volts—much better. Unfortunately, many beginners to electric flight start with high-loss systems and have problems with underpowered flight.



The resistance of your motor's armature affects the overall efficiency of your model's power system. Use the equations given in this article to determine your motor's armature resistance.

MOTOR EVALUATION EQUATIONS

To use these equations, run the motor twice—once with a prop and once without. Measure the voltage at the motor terminals; measure amperes; measure rpm.

RPM1 = rpm of the first run
RPM2 = rpm of the second run
A1 = amps for the first run
A2 = amps for the second run
V1 = volts for the first run
V2 = volts for the second run

• Armature resistance (Ra)
$Ra = (V1 - V2 \times RPM1/RPM2)/(A1 - A2 \times RPM1/RPM2)$

• Motor speed constant (Km)
$Km = 1{,}000 \times (V1 - V2 \times A1/A2)/(RPM1 - RPM2 \times A1/A2)$

• Power output
For any motor run:
A = current in amps
Vo = measured voltage at no load
Ao = measured current at no load
Vt = voltage at the motor terminals
Va = back voltage = Vt - (Ra x A)
RL = resistance loss = Vo/Ao

Po (lossless) = power output in watts = $A \times [Vt - (A \times Ra)]$
Po (with losses) = $Va \times [A - (Va/RL)]$

• Efficiency
%M = motor efficiency = $(100 \times Po)/(Vt \times A)$

%S = system efficiency = $(100 \times Po)/(Vb \times A)$

Vb = number of cells x 1.25 volts

• Rpm

$$RPM = 1{,}000 \times \frac{[Vt - (Ra \times A)]}{Km} \text{ or } 1{,}000 \times (Va/Km)$$

• The Abbott equation
The Abbott equation will give you prop diameter from a given prop pitch and the Po.

$Po = P \times D^4 \times RPM^3 \times 5.33 \times 10^{-15}$

• Thrust
My equation for thrust in ounces is:

$Thrust = P \times D^3 \times RPM^2 \times 1.0 \times 10^{-10}$

P = pitch in inches
D= diameter in inches
The 1.0 is a "form factor" and can vary from 0.8 to 1.4 depending on the prop blade shape; 1.0 is an average value.
Note: I made an error in the exponent of 10 in the February '94 issue's "Electrics" column.

Editor's note: *above are the equations for Ra and Km that were published in the February '94 issue's "Electrics" column. The order of arithmetic operations follows mathematical convention (this order is also tracked in the text). For the sake of added clarity, here are the same equations in a slightly different format.*

$$Ra = \frac{V1 - [V2 \times (RPM1/RPM2)]}{A1 - [A2 \times (RPM1/RPM2)]}$$

$$Km = 1000 \times \frac{V1 - [V2 \times (A1/A2)]}{RPM1 - [RPM2 \times (A1/A2)]}$$

USING THE EQUATIONS

Now we are ready to use the motor evaluation equations shown in the sidebar. In the February '94 column, as an example, I tested the WEP motor from Model Electronics* on five, seven and nine cells. The motor speed constant (Km) and the armature resistance (Ra) were calculated from two runs.

The first run was without load and yielded the following results: 50,400 rpm; 11.23 volts; and 3.6 amps measured at the motor terminals.

The second run was with a Sonic Tronics* 11.5x7.5 folding prop (through a 6:1 gearbox). The motor turned 39,300rpm at 9.60 volts; 20.6 amps.

When this information is run through the first two equations in the sidebar, Ra equals 0.0473 ohm and Km equals 0.000219 volt per rpm, or 0.219 volt per KRPM (one KRPM = 1,000 rpm). I use Km in KRPM units because it's easier to remember.

In the examples in the February column, I assumed a low-loss system with a total of 0.02 ohm between the battery pack and the motor—a loss of 0.012 ohm per cell for the battery pack, and an operating current of 25 amps. With these inputs, the 5-, 7- and 9-cell results for battery voltage (Vb), motor terminal voltage (Vt), motor output power in watts (Po), motor efficiency (%M), system efficiency (%S), and rpm looked like this:

	Vb	Vt	Po	%M	%S	rpm
5-cell	6.25	4.25	77	72	49	14,100
7-cell	8.75	6.15	124	81	57	22,600
9-cell	11.25	8.05	172	85	61	31,400

The system efficiency—not described in the February column—is the overall efficiency from the battery to the final motor output. It is calculated by the formula: %S = Po / (Vb x amps).

As you can see, as the voltage (cell count) goes up, the motor is more efficient, the total power package is more efficient, and the power goes up dramatically. Remember the warning in the February column, though: the motor must have a low armature resistance (0.06 ohm or less), and the wiring should have a resistance of 0.02 ohm or less. If this isn't the case, the motor and wiring will heat up in a hurry, and your plane will go down in flames!

A LITTLE PRACTICE

Just for practice, let's run through the calculations for a 5-cell pack.

Vb = 5x1.25 = 6.25 volts.

• The total ohms between the battery pack and the motor is:

5 x 0.012 ohms per cell + 0.020 ohms (wiring) = 0.08 ohm.

• The voltage loss is :

0.08 ohm x 25 amps = 2.0 volts.

• The voltage at the motor terminals is Vb minus this loss:

6.25 – 2.0 = 4.25 volts for Vt.

• Now calculate Vt minus Ra multiplied by current:

4.25 – (0.0473 x 25) = 3.07 volts.

This result (3.07 volts) is called "back voltage" (Va). It is the voltage the motor will produce if it is run as a generator at the rpm and current specified (in this case, 25 amps and 14,100rpm). Now multiply Va by the operating current, 25 amperes, to get power output (Po) in watts: 3.07 x 25 = 77 watts.

• The motor percent efficiency (%M) is 100 multiplied by Po divided by Vt multiplied by current:

$$\%M = 100 \frac{77}{(4.25 \times 25)} = 72\%$$

• The system percent efficiency (%S) is 100 multiplied by Po divided by Vb multiplied by current:

$$\%S = 100 \frac{77}{(6.25 \times 25)} = 49\%.$$

• RPM is 1,000 multiplied by (Vt minus A multiplied by Ra) divided by Km (or 1,000 multiplied by Va divided by Km):

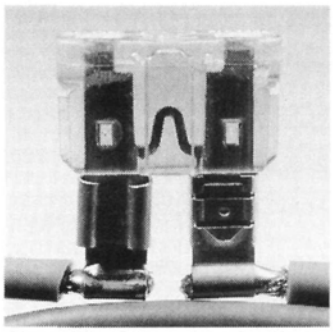
1,000 x (3.07/0.219) = 14,000.

Now you should be able to duplicate the numbers given in the February column!

Errata: I made some errors in the February column. The 5-cell, 15A %M should be 81%, not 86%. The 9-cell rpm should be 31,400, not 33,000. The equation for thrust should use 10^{-10}, not 10^{-11}. Thank you to the readers who caught these mistakes!

In Part 2, I'll be talking about motor power losses and how they affect what you've learned so far; and I'll explain how to match a motor to a plane correctly and how to pick the right prop for your motor.

If you have comments or questions, please write to me: Mitch Poling, 601 Medical Squadron, PSC 10 Box 1908, APO AE 09130.



Even this 30A automotive fuse, which protects your valuable electronics from damage, can cause power loss. This fuse has a resistance of about 0.003 ohm.

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

HOW TO

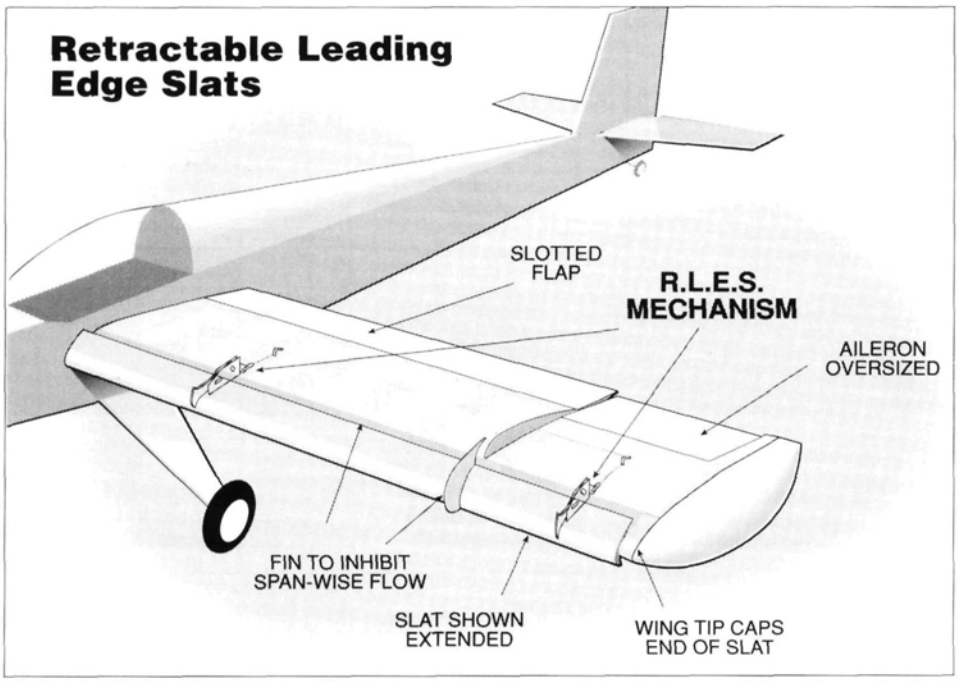
Improve your plane's low-speed performance

Build custom retractable slats

by IAN A. SAMPSON

MY MOTIVATION for developing a retractable slat for small-scale models stemmed from my interest in entering a design in the slow-flight contest that's being sponsored by NASA/NACA, Shapery Gyronautics and *Model Airplane News*. The contest awards points for slow flight as well as for fast flight, so I decided to attempt to design a model that would be capable of both.

I spent countless weekends researching in the aeronautical library at MIT in Boston and compiled many NACA reports on slats, flaps and various combinations thereof. The NACA reports cover virtually every subject regarding the design and performance of aircraft, and they're an invaluable resource.



Adding retractable leading-edge slats to your model is a good way to increase lift and lower landing/takeoff speeds. When retracted, the slats have little effect on wing performance.

WHY IT WORKS

The reason for having retractable leading-edge slats (RLES) is to help lower the effective wing loading and increase maximum lift. This lowers the landing/takeoff speed required, thus shortening the amount of runway needed to land and take off. In the extended position, the slat allows a higher angle of attack and lower air speed by reducing the airflow separation over the wing's top surface (separation causes stalling). This action allows the aircraft to maintain flight at a higher angle of attack without stalling.

Generally, RLES are combined with large flaps. The flaps can be plain, but slotted Fowler or Fowler-type, offset-hinged flaps yield the maximum increase in lift.

THE ACTUATION MECHANISM

For this design, I'm using the NACA 23012 airfoil with a Handley-Page slat that will be servo-operated. (See ordinates chart for airfoils and slats). Any airfoil may be used; you can establish the profile of the slat using a variation of the profile discussed here, or simply draw your own. Because there's a lack of scientific data on model airplane airfoil slats, my advice is to experiment with such details as slat gap and droop.

The slat's actuating mechanism is composed of an arm that rides in two slots that have been machined into the arm plates (see diagram). Because of the angle at which the rearward slot has been machined, the motion of the arm through the slots is an arc. An arc is required because the slat—as well as moving straight out from the wing—moves down, or droops (roughly following the contour of the wing's leading-edge profile). For the prototype, I machined the two slots in .060-inch-thick aluminum. You could use plastic instead of aluminum as long as it possesses some strength and rigidity and is machinable.

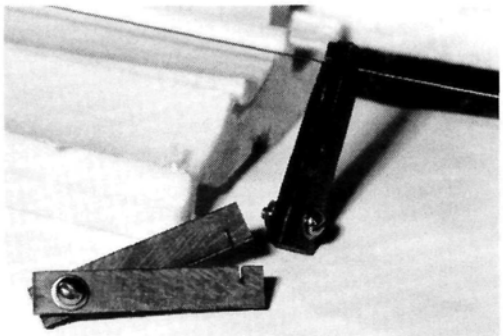
The arm is made of birch ply, but could also be made of plastic. I chose birch ply because it is easily glued to the slat. Two holes are drilled into the arm to accept—in the case of this prototype—two 4-40 bolts that ride in the slots. Brass ferrules could be used as sleeves on the bolts to act as a bearing surface between the bolt and slot. A slightly more involved option would be to replace the 4-40 bolts with pins and snap-rings.

The completed mechanism for the prototype measures 2x3/4 inches and fits into the space in front of the spar. The arm, which is attached to the slat, must be designed to meet your particular airfoil specifications. The arm's length will depend on wing chord and airfoil and the radio equipment used.

The number of actuators needed depends on the strength of the slat, and that will depend on how you construct it. Each slat actuator is connected to a bellcrank. For proper action of the slats, all the actuators must move in unison, and there must be as little play as possible. All of the machining for the prototype was done on a South-bend

PHOTOS BY IAN A. SAMPSON/ILLUSTRATIONS BY DALE TREECE

10-inch lathe with a milling attachment. (If you don't have access to a milling machine, you may be able to do the machining on a sturdy drill-press.)

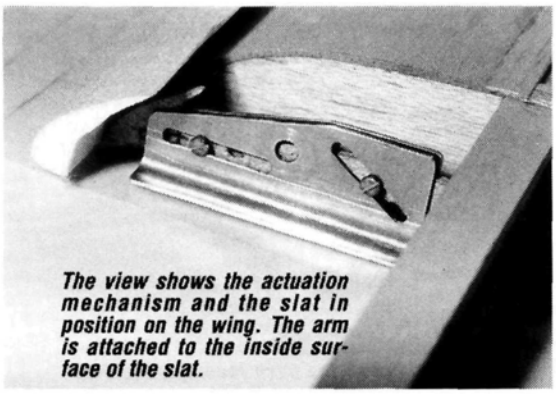


Here's the phenolic clip that the author used to manipulate the hot wire when cutting the slat profile out of the foam stock. The clip allows better control for a more accurate cut.

THE SLAT

The slat is constructed using blue foam (from a local home store) that's hot-wired with a homemade bow made with stainless-steel aircraft safety wire. It takes some doing to get consistent results when trying to hot-wire such a thin profile, but persistence pays off!

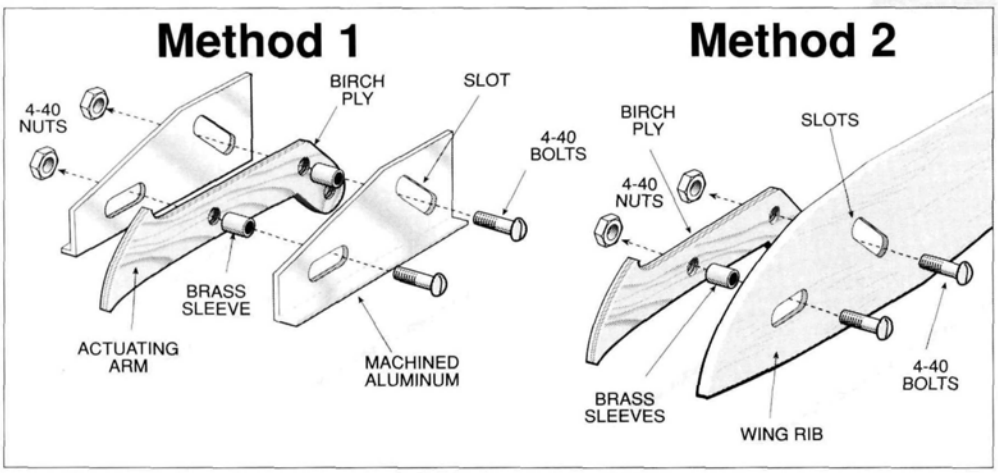
The sections are cut in 15-inch lengths, then glued together, end to end, with CA (I used a slow-setting type). Using a Delta 8-inch band saw, I then ripped the thin edge of the rough foam blanks to true them up. When cutting foam of this length, there's always the possibility that the hot-wire will bow, so this process removes some of the error.



The view shows the actuation mechanism and the slat in position on the wing. The arm is attached to the inside surface of the slat.

There are many options for finishing the slat blanks. A very rigid structure can be constructed by using 0.5-ounce carbon mat as a base layer and 1.7-ounce Kevlar (satin weave) for the top layer. Lay up the assembly with epoxy and vacuum-bag it. You will have to make a jig to keep the slats straight while they are curing in the vacuum.

When attaching the slat to the actuator arms, care must be taken to achieve a close fit between the slat and the wing. It's important not to impede the flow of air over the wing when the slat is retracted. When installing slats, do not run them clear out to the wingtip; there should be a full-chord wingtip to "cap" the end of the wing. Another option that also improves performance slightly is to install a fin at the flap/aileron junction, running it chordwise over the top of the wing and back to the beginning of the flap. This helps to reduce the effects of spanwise airflow.



Method 1 shows the author's recommended attachment of the RLES mechanism. As an option, the arm can be attached to a suitable wing rib (Method 2).

This Helio Courier of the '70s made use of RLES to improve its STOL capabilities.

Slat Background

Retractable leading-edge slats are used on many general-aviation aircraft, such as the Helio Courier single-engine STOL aircraft and the Rockwell Sabreliner business jet, as well as some of the early F-86 fighters. The slats allow the aircraft to attain higher angles of attack, and they increase the wing's effective lift, thus allowing slower flight.

All these examples use the Handley-Page slat, which automatically extends or retracts depending on the aircraft's speed and angle of attack. (Handley-Page was one of the first companies to develop leading-edge slats before WW II; their design is as current now as it was then.) The pilot had only to place the aircraft in a specific attitude at a certain air speed, and out they would pop—sometimes unexpectedly, as was the case with the F-86! The constant changes in attitude and air speed encountered in air-to-air combat caused the slats to extend and retract at very inopportune times—as if you deployed your drag chute to go into the thick of battle! Suffice it to say that automatic slats were not used for very long on the F-86.

The slats do, however, work very well on aircraft whose flight profiles do not involve close combat. Most heavy airliners have motorized RLES, meaning they're pilot controlled. As a passenger on an airliner, you may have noticed the many changes the wing goes through as it's readied for landing. The slats and flaps are extended as the plane approaches the runway. This sharply reduces the aircraft's speed and leaves the wing looking very much like a sieve; by the time the wheels touch down, you can see clear through it.

FLYING WITH SLATS

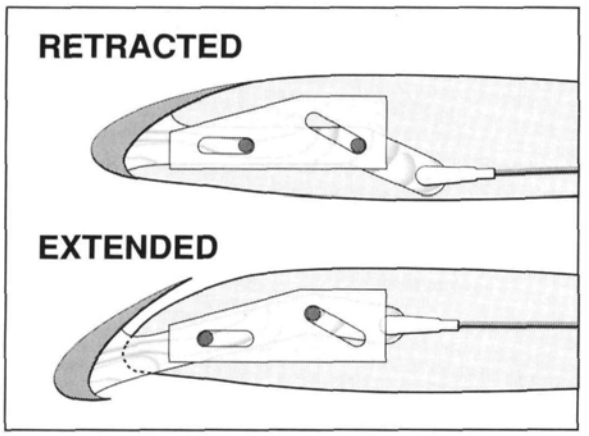
Power is more efficiently converted into lift when slats are employed. Slats, especially when combined with flaps, require more power to maintain stable flight. With slats, for instance, you would not throttle back for landing—as you might with a traditional aircraft—but instead, you'd keep some power on.

The need for power is especially apparent in the case of slow flight, which entails a maintained, high-angle-of-attack, "dirty" (slats and flaps extended) wing configuration. Without enough power in a "dirty" configuration, the aircraft will waffle and

ORDINATES FOR 23012 AIRFOIL WITH SLAT AND SLOTTED FLAP

NACA 23012 Airfoil Modified			Handley-Page Slat			Slotted Flap		
Station	Upper Surface	Lower Surface	Station	Upper Surface	Lower Surface	Station	Upper Surface	Lower Surface
2.50	-1.71	-1.71	0.00	–	0.00	0.00	-1.29	-1.29
5.00	2.40	-2.26	1.25	2.67	-1.23	0.40	-0.32	-2.05
7.50	4.25	-2.61	0.25	3.61	-1.71	0.72	0.04	-2.21
10.00	5.50	-2.92	5.00	4.91	2.53	1.36	0.61	-2.36
14.00	6.99	-3.39	7.50	5.80	4.36	2.00	1.04	-2.41
15.00	7.19	-3.50	10.00	6.43	5.58	2.64	1.40	-2.41
20.00	7.50	-3.97	14.00	7.05	6.99	3.92	1.94	–
25.00	7.60	-4.28	–	–	–	5.20	2.30	–
30.00	7.55	-4.46	–	–	–	5.66	–	-2.16
40.00	7.14	-4.48	–	–	–	6.48	2.53	—
50.00	6.41	-4.17	–	–	–	7.76	2.63	–
60.00	5.47	-3.67	–	–	–	9.03	2.58	–
70.00	4.36	-3.00	–	–	–	10.31	2.46	–
80.00	3.08	-2.16	–	–	–	15.66	1.68	-1.23
90.00	1.68	-1.23	–	–	–	20.66	0.92	-0.70
95.00	0.92	-0.70	–	–	–	25.66	0.13	-0.13
100.00	0.13	-0.13						

Note that: • Ordinates are given in percent chord and are measured from the chord line (thus defining top and bottom surfaces). Station ordinates are measured from the leading edge. • The airfoil is modified to incorporate a slotted flap, the ordinates of which are in the chart. • The above data was taken from *NACA Report L-261*.

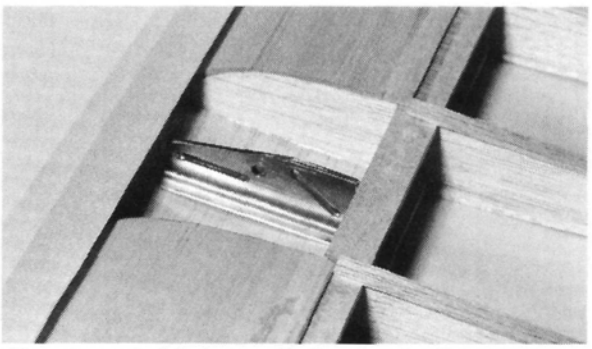


The figures above show the slats in both extended and retracted positions. Note how "clean" the wing's leading edge is when the slat is retracted and how it "droops" when extended.

lose altitude. Some full-size piston aircraft that employ slats also have special gear reductions on the engine to reduce prop rpm and increase overall torque. This increase in torque allows the aircraft to "hang" on the prop and more fully enjoy the benefits of slats.

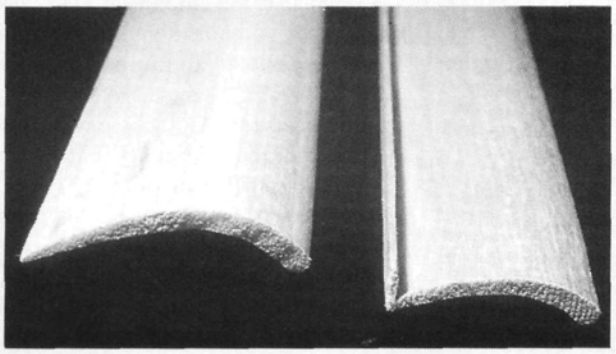
There are many ways to incorporate this mechanism in a model; I have illustrated one way. I hope you have found this information compelling enough to try slats out and experiment with further ways to include them in your aircraft.

Many thanks to my father, who helped with machining the parts for the slot mechanism. Composite materials were bought from Aerospace Composites*. ■



The wing and slat shown with the open leading-edge compartment for the slat mechanism.

Don't want to cut foam? Pre-made slat and slot material



For many of us, the thought of hot-wiring slats out of foam and then laminating and vacuum-bagging them may be a little intimidating, but don't worry, someone has done most of the hard work already. High T.E.K. Models* offers pre-shaped, leading-edge slot material that can also be used to construct leading-edge slats.

The slot material, which is balsa, is available in 3-foot lengths in 1½- or 2-inch widths. The only limitation to this product's use is that the leading-edge shape of your wing must approximate that of the slat's inner surface so that, when retracted, the slat doesn't interfere with the wing's profile. If you're interested in these pre-shaped slats, give Tom Krapp of High T.E.K. Models a call (616) 458-2261. Or, if you or someone you know make a similar product, let us know here at *Model Airplane News*., 251 Danbury Rd., Wilton, CT 06897.

—Frank Masi

SPORTY SCALE

FRANK TIANO

ENGINE WORK, HARDWARE AND A NEW RACING T-6 CLASS

FROM THE NUMBER of phone calls and letters I've received, in the short time since *Model Airplane News's* Top Gun coverage hit the newsstands, I would have to guess that seeing all those magnificent aircraft kindled an interest in building some sort of scale model in many of you. What's curious is that several of you requested information on racing airplanes that, until recently, were totally out of my scope.

I guess that the races at Galveston, Reno and Madera have created a substantial degree of interest for those who love scale models, but prefer to fly them instead of doing the full-blown competition thing where they must be static-judged, too. It's no secret that I've always considered WW II airplanes my favorites; "heavy metal" is just plain awesome to me. I like the Formula Ones, the Thompson Trophy Racers, the T-6s and, especially, the Unlimiteds—probably because 95 percent of them are derived from a heavy metal aircraft. With all this in mind, until a full-fledged racing columnist happens along, I'll try to include some of the racing aircraft, products and building hints whenever I can.

Speaking of racing airplanes, Charlie Johns of Angelo, TX, did a fab job on one of Don Smith's Curtiss R3C racers: ⅓ scale; 88 inches and hauled by a Sachs 5.8; 45 pounds; Zinger* 24x12 at 6,700rpm; brass radiators on wings and floats (made with 580 pieces of 1/16 balsa!). Kathy Johns completes the diorama.*

We showed you Dick Rotkosky's F-86 several months ago. Well, it's finished and has flown. Final weight is 25 pounds; great-looking paint job; 60,000 rivets!; 1/6 scale.*

Remember, I'm still learning, so I'm kinda hesitant to print too much until I've handled a product myself, have seen it work myself, or have been informed by someone extremely knowledgeable and unbiased. So until further notice, if you'd like to share some of your race-plane photos with the regular readers of "Sporty Scale," just drop me the pics and a brief

T-6 RACING—MIDWEST STYLE!

One of the problems commonly associated with competitions, especially different forms of racing, is the cost of competing. If the rules are fairly presented and if the promoter and host club do a good job and the site is sufficient, only the pilots' skills need to be honed. These are fixed factors. Unlimited racing requires not only big bucks but also a lot of free time to go racing.

As of yesterday, only a couple of races catering to less expensive classes have been announced: the Thompson Trophy and T-6. But even if there were more events, some say that it's still too expensive for most modelers. Now this may be debatable, but I think that there's a lot of truth in that thought. So, being the kind of person who just never seems to have enough to do, I think I've just about got a set of rules and a schedule ready for T-6 racing.

T-6 racing will debut in 1995—Midwest style! Here's Eddie Rogala's version powered by a Saito 1.20 and fitted with an FTE radial and Robart* retracts. Top speed?—approximately 80 to 90mph.*

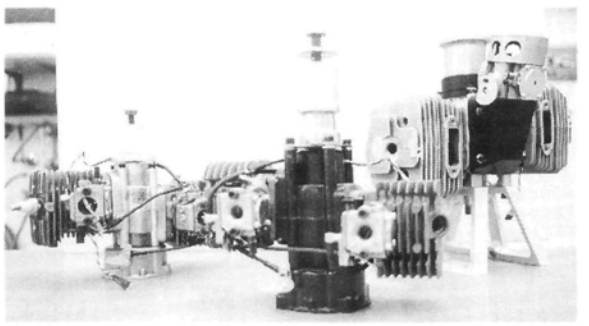
My main objective will be to make T-6 racing competitive, fun and affordable all at the same time. I will focus on safety first, fun second and competition third. The fact that there will be a nice purse is just the extra gingerbread. The basic rules are not cast in concrete yet, and I truly welcome any and all input before we put the

description to either *Model Airplane News* (251 Danbury Rd., Wilton, CT 06897), or FTE*.

HORNER HYPE

The first bit of information I'll share with you this month is how to go about making your Horner Twin perform as you'd like it to. It's certainly no secret that this 4-plus-cube is a friendly engine but comes up real short in two departments, one being revs, the other being horsepower. So, in the stock configuration, the two I purchased ran real smooth but would hardly fly a 30-pound Siewert KI-84. Yet a G-62 hauled that same plane around at a ridiculous rate of speed!

The solution for me, and possibly others who have the same problem, is to send the engine off to Ray Woodard at CenterMark Inc.*, and for $260 (plus postage) they turn your wimp Horner into a motor you can be proud of! Mods include new jugs and carbs as well as a fine-tuning before it's shipped back to you. The new jugs are bona fide Dolmar* parts, so you can expect long life and great performance. The resulting engine is absolutely legal for the great scale Formula One class of racing that limits you to 4.6 cubes. CenterMark also offers a 6ci engine that seems to run very well also. I haven't seen all the competition yet, but so far, the "6" handles well, puts out plenty of power and fits most of the racing designs.



CenterMark's 4.6-inch Horner conversion up front. New cylinders and carbs really add to its power output. (CenterMark 6 cubes on left; Aerrow 200cc—12 cubes—on right.)

J&J Hobbies has a pilot just for you. In lots of sizes and difficult styles, and they're posable, too. The leather jacket and custom clothing are optional.

PILOTS, MAN YOUR AIRCRAFT!

I know that it's sometimes a pain in the phistaris to find just the right pilot figure for a particular airplane, especially if there's something unusual about the requirements. Maybe a lot of the pilot spills out of the cockpit, or you need a realistic facial expression, or you prefer soft, realistic clothing instead of a hard, finished, painted outfit. Or maybe you just want the luxury of posing your pilot in any position you'd like instead of the same pose everyone else uses. Well, someone finally took the bull by the horns and addressed this problem in a very successful way. J&J Hobbies* has taken the DGA airman series of pilots and has done all the hard work that most of us refuse to do or just don't know how to do. This includes a new head and a clothed body. Best of all, the bodies are fully posable, and the heads may be canted on an angle. The clothing is custom-made and well-done.

For those who don't need a full figure, a bust is available, too. Currently,

rules and schedule into force sometime after February 1995.

So far, here's what we've got: all aircraft must be absolutely stock Midwest* T-6 kits. No dimension may be changed or altered; this includes: wing and tail span, thickness and area; fuselage cross-sections and length. Any retract gear may be used, and fixed gear is legal. Fiberglass parts may be substituted for any plastic parts of the same size. All aircraft require a scale-looking spinner. Any commercially available engine up to 1.24cid displacement—2- or 4-stroke, on glow fuel or gas—may be used. Tuned pipes won't be allowed. Propellers will have a minimum diameter of 14 inches. "Commercially available" means a minimum of 1,000 engines have been produced, and they may be purchased at hobby retail stores. Minimum weight is 13.5 pounds without fuel.

Races and heats will start without a pace plane. One of the aircraft in any particular heat will be the pace plane, and that will be determined by the appearance rating of the aircraft—much like it's done in Formula One racing. In other words, the planes are lined up and scored on the perfection of their finish. Scores are categorized and the T-6 with the highest score for finish will be the pace plane in the heat or race it's performing in. Any paint scheme may be used. Determining a pilot's race number will be easy: he simply joins the T-6 Society, gets his number and rule book and goes racing!

The T-6 Society will advertise very soon. Membership will be a nominal $40 for the first year and probably $25 for subsequent years. It will include a race number (which you will choose and keep as long as you are a member), a rule book and a slick, members'-only, T-shirt. This is gonna be more fun than anyone would ever figure—I promise. That is, if we can get it off the ground. We really need and want input, guys; so please drop me a line with any comments or questions, and don't forget an SASE for your personal answer. Look for more information right here in *Model Airplane News.*

J&J offers four sizes: 1/6, 1/5, 1/4 and 1/3 scale. Prices for these ready-to-fly guys range from $19.95 up to $59.95, and Jim Whitehead and his wife, Jeri, will even make you a custom-outfitted pilot for a few extra bucks. For example, a request for a leather jacket will only add 10 bucks to the price!

I've received a couple of examples of these airmen and must admit that the facial expressions and eyes are very realistic. My buddy Joe Manzella put a civilian version in his new 1/4-scale Ryan STA kitted by Golden Age Models*, and I gotta tell ya, it added a whole new dimension to that airplane. Though their WW II military pilots still need a little work, every other product they make is well worth the money, especially when you consider that there are still a few, less realistic, pilots out there that cost the same or more for just a painted plastic bust.

If you're flying fast, heavy, scale airplanes or racing machines, you might want to check out Scale Aviation's line of H.D. Hardware.

THE MISSING LINKS

During the first seven months of 1994, I think that I may have spent more time at model airplane events than any 12 months previously combined. And I would have to say that this past year has taught me an awful lot—a lot about airframe stress in particular. I've seen midair collisions; crashes caused by flutter; crashes resulting from one control surface getting hung up or falling off altogether; and the total destruction of many racing aircraft because of airframe fatigue, or poor building practices.

Now, we must realize that we sometimes use the words "poor building practices" when we really mean that the modeler perhaps didn't know any other way to construct his airplane. In the coming months, we will feature an entire column of how you may use carbon fiber and fiberglass sheet to reinforce your models. For now, let's touch on an often neglected part of model construction: the control linkages.

Large, heavy, fast, scale models simply can't use the traditional hardware that we've come to love and trust over the past few decades. Bellcranks that work perfectly on a .60- to .90-size sport model will surely fail eventually on something packing 5 or more cubic inches of vibrating fury!—especially if traditional mounting methods are used. This may be applied to the use of hinges, cables, pushrods—the works.

Bill Raub owns and operates a company called Scale Aviation USA*. Bill's main objective is to provide high-quality, heavy-duty, high-performance linkage parts for large, heavy and fast model aircraft. I won't go into full commercial mode here, but I gotta tell you that this guy has some neat stuff. A little expensive? Yes. A lot safer? Absolutely! For example, Scale Aviation offers bellcrank assemblies in both 90-degree and idler styles machined out of high-grade aluminum. We're talking about no-slop units with low friction, oil-impregnated bearings! And it doesn't stop there.

Their catalogue also shows what may possibly be the finest cable-control system (pulley style) you've ever laid your eyes on. And there are guide pulleys, too. Or maybe you need a metal strip hinge—you know, something like a miniature door hinge, custom-cut to any length. Or engine-vibration isolators with various degrees of hardness, just like the ones used in full-size air-

(Continued on page 96)

P-38

(Continued from page 33)

project. I decided to install Sermos connectors between the series-wired rocket batteries and the speed controller. This allows me to charge both 4-cell battery packs simultaneously from this convenient location.

FINAL THOUGHTS

Nothing available compares with this fast, efficient model. Electric-powered twins are considered the most reliable, but this twin drive is even safer. Building the P-38 was lots of work, but the result justifies it. For security reasons, the May 1939 *Model Airplane News* cover art shows an XP-38 in stand-off scale; Kress made their version in stand-off scale for better flying.

If you crash, the P-38 is easy to repair. The strong foam parts, which aren't easily broken, are easy to repair. And the Vivak™ shells can be bought separately from Kress Jets.

What I like best is that it's finished; it flies great; and there's nothing about it I dislike.

**Addresses are listed alphabetically in the Index of Manufacturers on page 121.* ■

SPORTY SCALE

(Continued from page 92)

craft. No junk here, guys! There's even a sophisticated metal pushrod system that you've got to see to believe. All parts are expertly machined for a perfect fit and long life.

But—best of all—all are engineered to take serious abuse. Everything offered looks like a full-scale aircraft part that has been reduced in size just for us! Install them according to the directions, and you'll have a greater sense of security. In the past year, I have used nothing but Scale Aviation control parts on any airplane that's more than 80 inches in span, 18 pounds in weight, or faster than 100mph. Their 21-page catalogue is like a little high-performance bible. And they've got a couple of scale kits and scale accessories, too. The cost is a mere $2. My suggestion: send the deuce.

BETTER BUSINESS, PLEASE!

And, by the way, I'd like to remind you that in our everyday life, there really is no tooth fairy. What I'm saying is that if you see something that seems way too good to be true, it probably *is* bogus. I am very tired of people in our sport getting ripped off by unscrupulous, fly-by-night companies that place an attention-swiping ad, just one or two times, asking for, and many times receiving, our money in return for either something that we never get, or something totally unusable.

FAREWELL, JIM

Sometimes, I must close this column on a sad note. This is one of those times, because a dear friend and one of our sport's biggest supporters has left us. Dr. Lyle Pepino—more commonly known as "Jim"—passed away in his sleep this past June. His scale documentation company, Scale Plans and Photo Service* will continue to operate until supplies are depleted. It will function with Jim's loving wife, Anne, at the helm.

If you have never purchased one of their $5 catalogues, I suggest that now may be the time. It's about 100 pages thick and is literally stuffed with plans and three-views as well as thousands of photo packs. It's a great find for any scale enthusiast. Jim Pepino spent half his life compiling this catalogue. Jim, you will surely be missed. Your six is cleared.

**Addresses are listed alphabetically in the Index of Manufacturers on page 121.* ■

EDITORIAL

(Continued from page 6)

SLOW-FLIGHT DESIGN-CONTEST UPDATE

Early experiments with models in the indoor electric class have shown that significant changes in density/altitude can markedly affect performance. One indoor electric ship on the East Coast flew well in colder weather but had a hard time staying aloft on a hot summer day. For this reason, it would be helpful to the judges if entrants record the density/altitude that prevails during any test run. Ascertain the barometric pressure (use a barometer, or call the local weather station and request the "uncorrected" barometric pressure for your location), and record the temperature and altitude—it's that simple. Also, indoor electric competitors should note that the requirement to be able to fly twice around the perimeter of an indoor basketball court is a loose one. Cutting corners or drifting over the borderline one way or the other is not a deal-breaker. The point of this requirement is simply to ensure a minimal capability in terms of flight time and distance. Readers who wish to see a detailed summary of the rules to this worldwide contest should look at the September *Model Airplane News* editorial (see also the ad, this issue, describing the contest). Any questions should be forwarded to my attention at the address noted above. We await your entries! ■

AIRWAVES

(Continued from page 9)

1/5-scale Cubs, including the J-3, the Super Cub and the Piper Cub Special (PA 11). The Pica Aeronca Sedan also looks great and is right in the .80 4-stroke engine-size category. Contact Pica Enterprises Inc. at 2657 N.E. 188 St., Miami, FL 33180; (305) 935-1436.

If you get into more advanced scale competition, remember that your model should match your three-view. Get all your documentation before you start to build. Build straight, and modify your kit in any way that's required to make your model's outline match your three-view drawing exactly (no two three-views are the same!). Throughout construction, use only one three-view, and when you've finished building your model, include that three-view in your documentation package. Document your subject aircraft well, build it straight and true, and learn how to fly it in a scale-like manner. You'll soon be in the scale winners' circle. GY

HOW TO

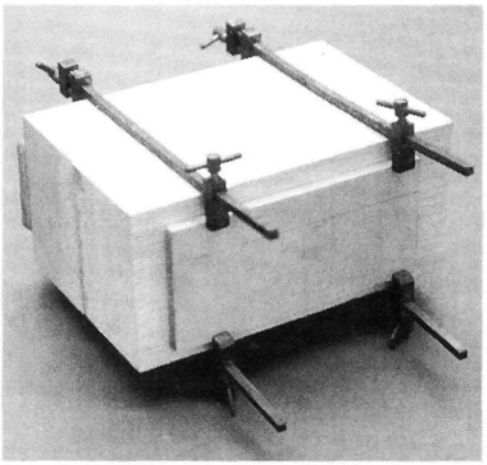
Techniques for duplicating complicated shapes

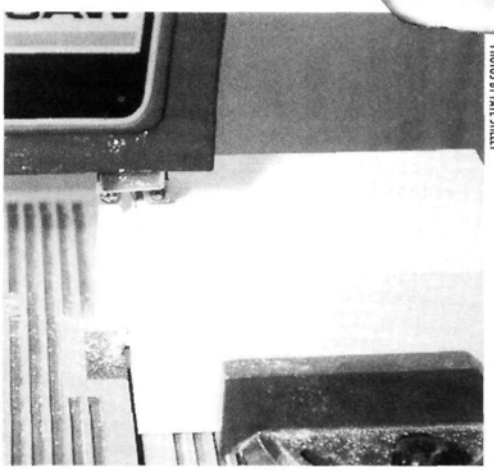
Carve and Shape Block Balsa

by FAYE STILLEY

IN BUILDING MY latest model, the I.T.P.* Caproni, I replaced the vacuum-formed tail-cone parts with carved balsa blocks. I did this so that I could cover the finished parts with heat-shrink covering to better match the rest of the airframe. This article shows the various steps for duplicating a complicated part out of block balsa.

The exhaust cone has a complex shape with both convex and concave surfaces. It's also somewhat conical and has a hole through the middle. You may never want to make a shape like this, but the techniques are the same for carving a cowl, an air scoop, a turtle deck or any number of similar shapes. Working with block balsa can be greatly simplified with a little planning and some special techniques. It doesn't have to be a hacking, carving, shaving experience that puts blisters on your hand; block balsa is easy to work with if you use power tools for most of the work.

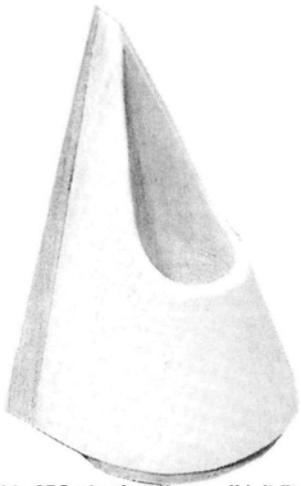




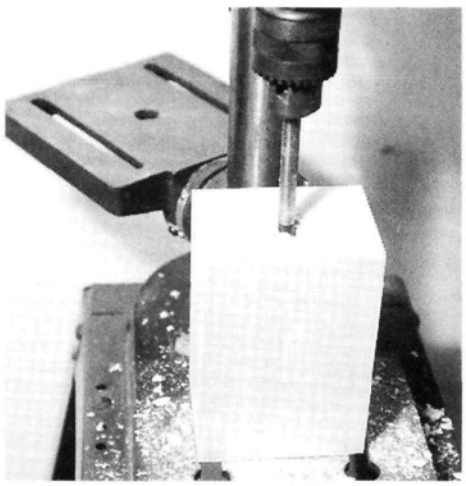
PHOTOS BY FAYE STILLEY

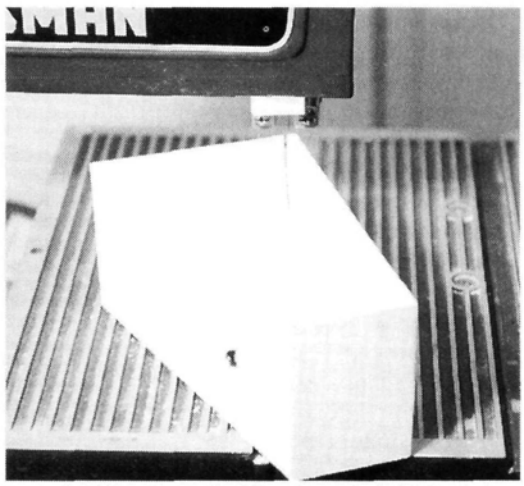
1 *Left: the tail cone measures 2¾x3⅝x5¾ inches. Taking a big hunk of wood and just carving away would have been a nightmare. In addition, a 3x4x6-inch block of balsa would be expensive, especially considering that about half of it would become wood chips in the process. Begin by cutting a 12-inch-long piece of 2x3-inch balsa block in half. Then glue the two 6-inch-long pieces together to form a 3x4x6-inch block. Aliphatic glue and clamps or weights should be used. CA, epoxy and most wood glues sold in hardware stores are very difficult to sand. Pica/Robbe* makes an aliphatic glue called "Gluit" that dries quickly and is relatively easy to sand.*

2 *Right: the next challenge is drilling a ¾-inch hole straight through the block. First, use a band saw to cut square surfaces on both ends of the block so that the drill will travel straight and the piece will fit correctly against the fuselage. Only remove enough wood to form square ends.*



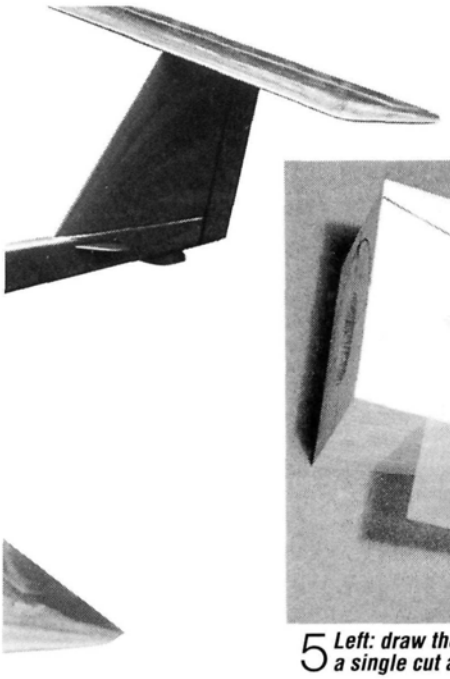
The kit's ABS-plastic tail cone didn't fit well and couldn't be covered with heat-shrink. Here, the finished part carved out of block balsa fits precisely and will match the rest of the model after it has been covered.

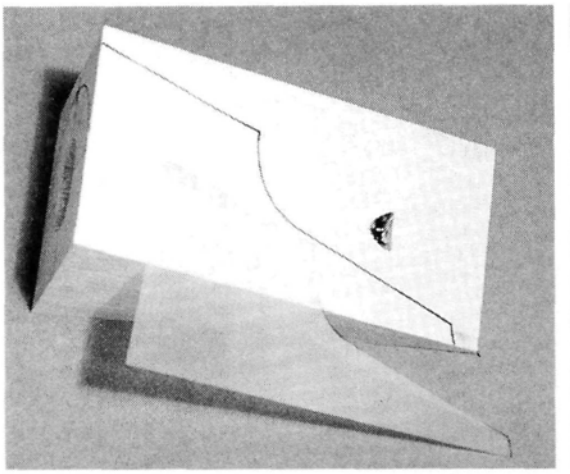


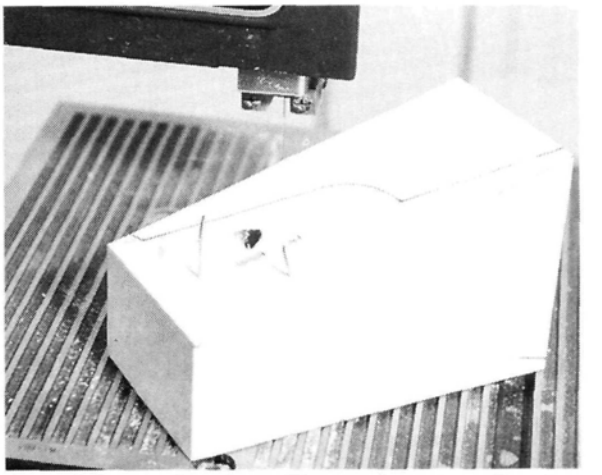


3 *Left: square up the block on the drill-press table, and drill as far as the bit will reach. Drill the hole slightly undersize to allow for sanding later; even if you use a Forstner bit (probably the smoothest-cutting bit available), the inside of the hole will be rough. Few tools are made with balsa in mind, so we modelers must make adjustments in how we use them.*

4 *Right: make the two straight side cuts first. Use a band saw to ensure that the cuts are square. (If you use a hand saw, allow enough space between the drawn line and the cut for final shaping.)*



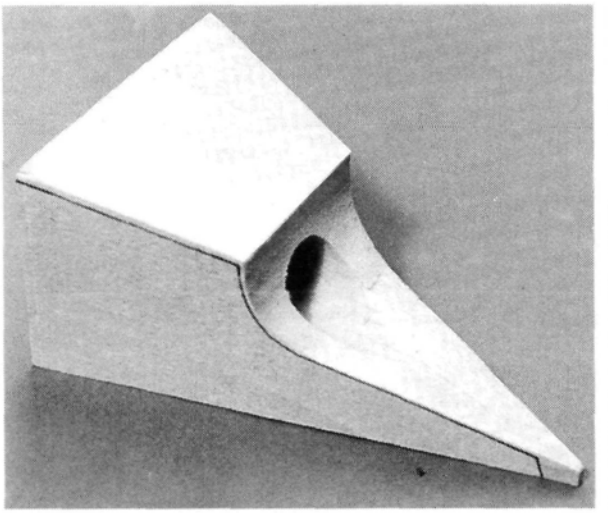


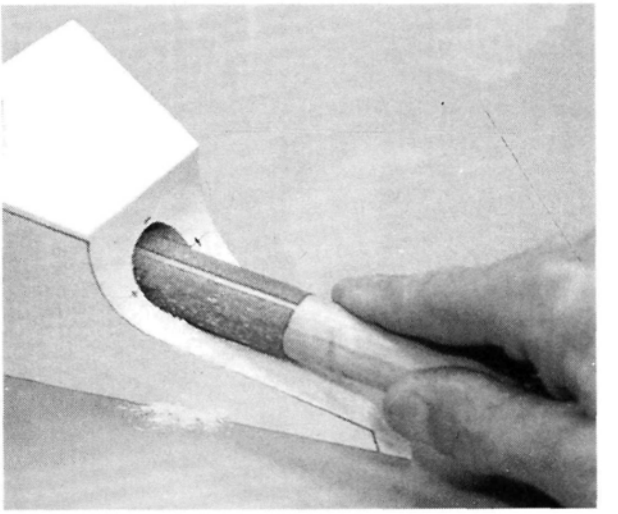


5 *Left: draw the profile shape on the wood using a pattern. You only have to draw the profile once, because you'll make a single cut all the way through the block using a band saw. If you use a coping saw, be sure to keep the cut square.*

6 *Right: to get a square cut using a band saw, pin one of the side pieces that you cut off earlier back onto the piece you're cutting.*

7 *Right: make the profile cut, leaving a little extra material for insurance. This allows any irregularities in the cut to be corrected. (I blame the saw for the irregularities but, to be truthful, the hand of the operator causes them.) The previously drilled hole is now exposed and is ready for final shaping.*

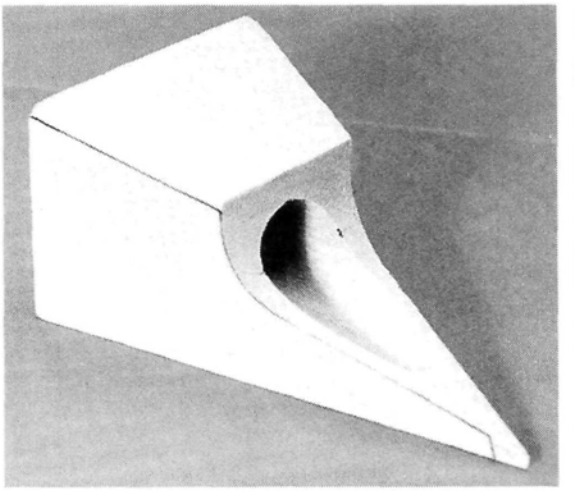


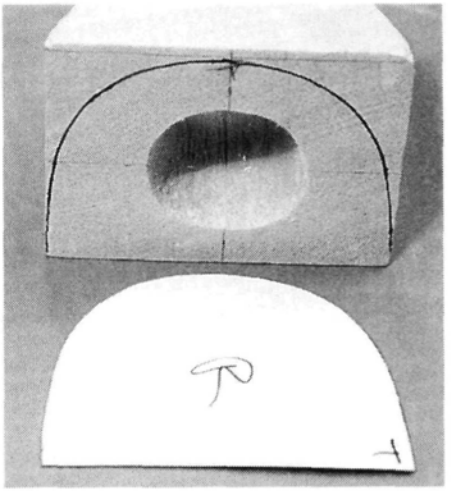


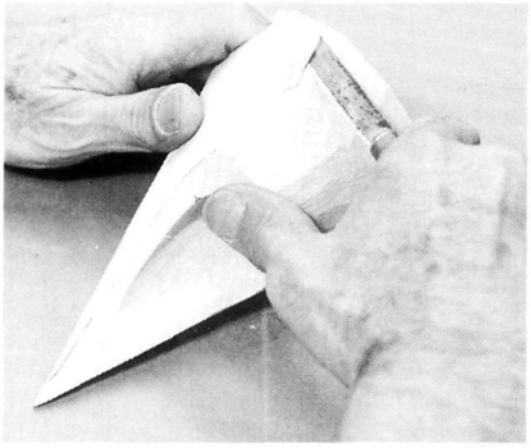
8 *Far Right: smooth and shape the inside surface of the hole using a Perma-Grit* sanding tool. These tools have a tungsten-carbide surface and come in many shapes. The sanding tool has coarse grit on one side and medium-fine grit on the other. The coarse grit "eats" balsa away quickly, and the other side prepares the balsa for final sanding. Mark the opening of the hole to guide the shaping operation.*

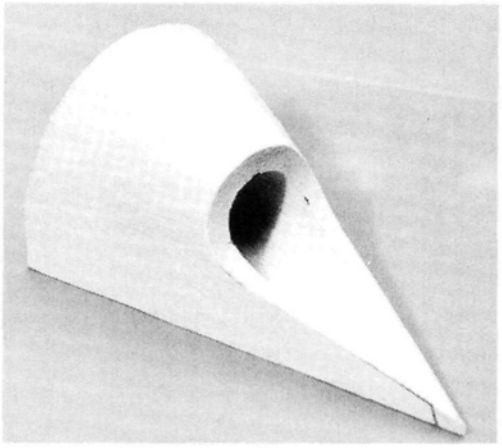
9 *Right: as you shape the hole to nearly its final size, you should leave a little material for final finishing. Also shape the curved face of the cone almost to the finish line. I use the word "shape" to describe cutting away the block down to less than 1/16 inch of its final form. I consider the rest of the process "finishing."*

10 *Far right: make a pattern for both the right and left sides of the fuselage where the cones will eventually fit (I made two cones for the Caproni). Use the pattern to draw the outer rounded shape of the cone. The glue line that's between the two blocks makes a nice center-line reference. You can see in the photo that the shape isn't perfectly round.*



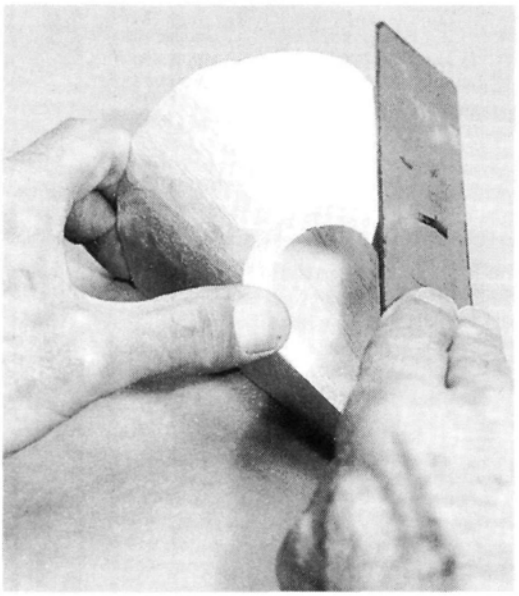




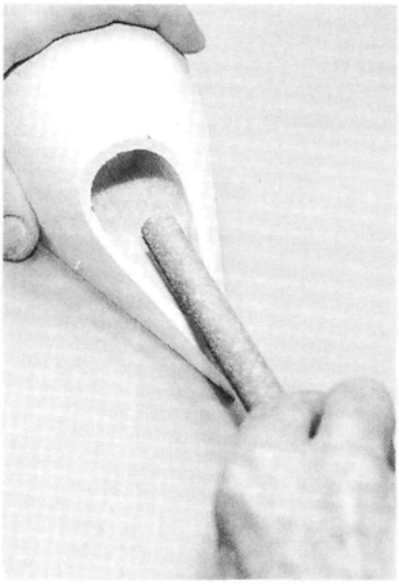


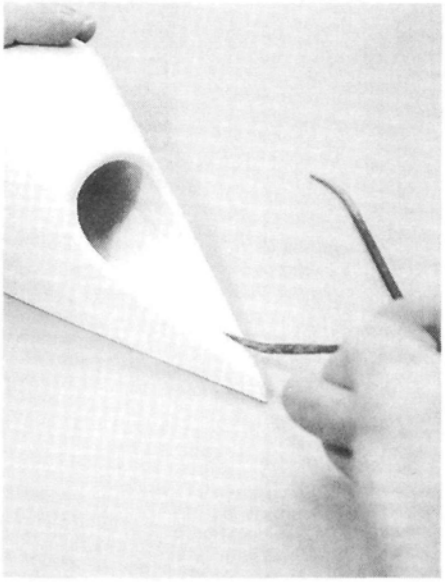
11 *Far left: whittlers will love this part. After most of the work has been finished, we finally get to the carving part. I use an X-Acto no. 26 blade in a no. 2 handle to do this type of work. It goes very quickly because you can take off big hunks of wood with each cut. Care should be taken when doing this kind of cutting, because balsa grain has a tendency to grab the blade tightly and then release it without warning; thumbs are particularly vulnerable.*

12 *Left: the carving has been completed. Leave about 1/8 inch of extra stock all the way around the rounded part of the cone for shaping.*



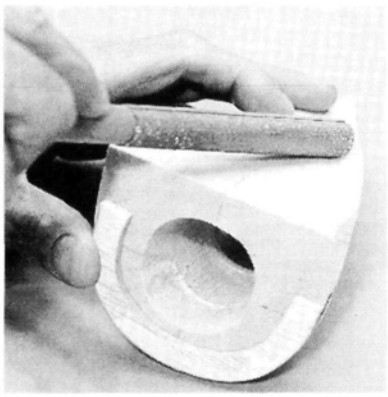
13 *Here, half of the cone has been shaped using a flat, coarse-grit Perma-Grit tool. The shaping goes quickly, and the cone will soon be within 1/16 inch of its final shape.*

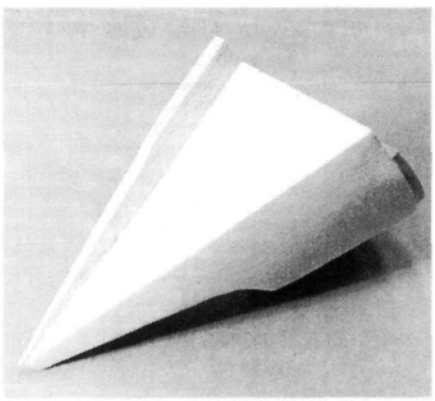




14 *Left: using another, smaller-diameter Perma-Grit tool, final-shape the hole and the trough. I use the medium-fine side of the tool for doing this kind of work. It leaves the wood smooth enough for final sanding with sandpaper. I wrap sandpaper around the tool's handle for the sanding operation.*

15 *Right: the cone has been sanded smooth and round around the hole and the edges of the trough. Use riffler files to shape the final detail at the point of the trough. These little files come in many shapes and can shape balsa as smoothly as sandpaper.*

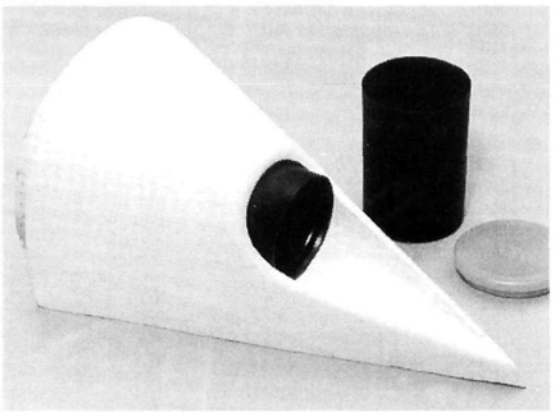




16 *Left: you'll need a fairing to fit the cone properly to the underside of the tail boom. Glue a piece of wood of the appropriate size to the bottom of the cone. It's always easier to glue on small details like this instead of attempting to carve them into the block balsa.*

17 *Right: shape the fairing to fit the contour of the fuselage bottom. Once again, a Perma-Grit tool makes the job easy and quick. The horseshoe-shaped piece of balsa on the rear of the cone fits into an opening at the rear of the fuselage to connect the assembly. To ensure that the final shape of the cone will match the fuselage shape exactly, attach this piece and test-fit the cone just before the final shaping.*

**Addresses are listed alphabetically in the Index of Manufacturers on page 121.* ■

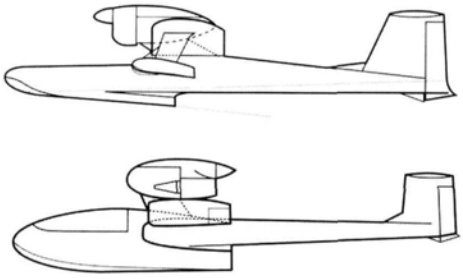


18 *After the cone has been final-sanded, it's ready to be covered or painted. The simulated exhaust duct is a black film canister that has a matte finish. It looked realistic and didn't have to be painted. The finished tail cone is only for "looks"; I remove it when I fly the airplane. If it had been a permanent part of the airplane, I would have hollowed it out to within 1/4 inch of the outside surface and added a layer of light fiberglass to the inside. This fiberglass treatment is standard for all the balsa cowls I make; it keeps them light and makes them strong and fuelproof.*

HOW TO

Hull and Float Design

Part 1



by Andy Lennon

FEW EVENTS give greater satisfaction than the successful first flight of a model airplane that one has conceived, designed and built. Ensuring the success of that first flight and of subsequent flights is what this series is all about.

Flying off water adds two new elements: hydrostatics (buoyancy) and hydrodynamics (planing lift). Both will be addressed in this two-part article.

Flying boat or floatplane flying is, if anything, more fun than flying off land. There are few trees over water to reach up and grab your model, and water is more forgiving than terra firma.

FLOAT AND HULL BASICS

Figure 1 shows views of a float, or hull, with three cross sections.

Note the following key points:

• The "step" separates the forebody from the afterbody.

The Sea Hawk may be converted from tricycle landing gear to a single float.

• The "keel flat" is the reference line for the "trim angle" shown in Figure 2.

• The "sternpost angle" governs the hull's (or float's) trim angle at the "hump."

• The "beam" is a critical dimension.

• The "step depth" is also a critical dimension.

• The "angle of deadrise" bears on the hull's planing performance.

• The "deck" is only a reference line. The top contour is the designer's choice.

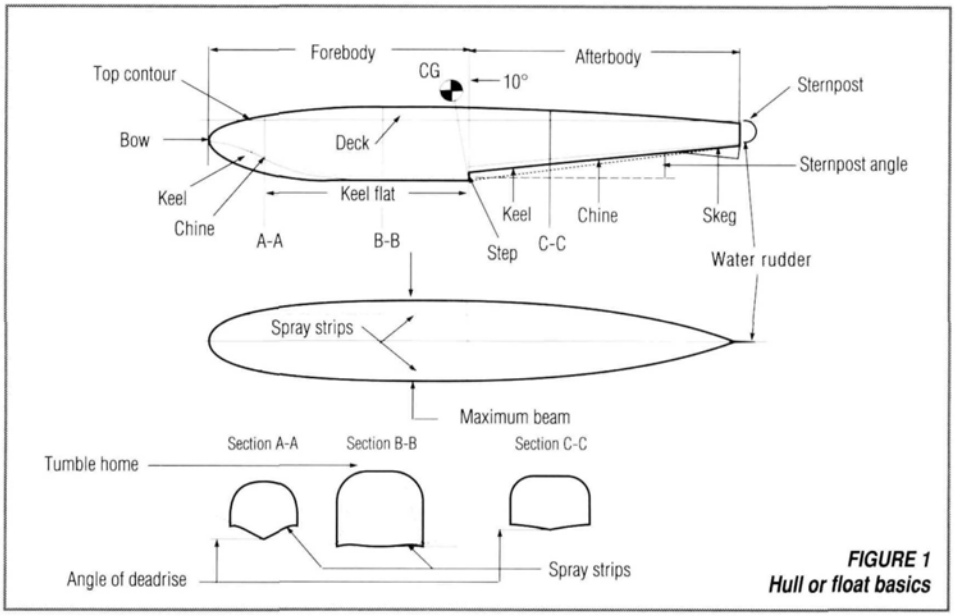


FIGURE 1
Hull or float basics

FLOAT AND HULL FACTORS

For successful water flying, the following conditions must be met:

• There must be adequate buoyancy with substantial reserve while afloat.

• Planing surfaces should have a wetted area that's large enough to permit the model to accelerate to flying speed quickly.

• The hull's (or float's) trim angle at the hump should not cause the wing's airfoil to exceed its stalling angle of attack.

• Spray should be well-controlled; in particular, it should be prevented from hitting the propeller.

• There should be no porpoising on takeoff, and no skipping on landing.

• The model should weathercock to face into the wind when at rest, or when taxiing at low speed on the water.

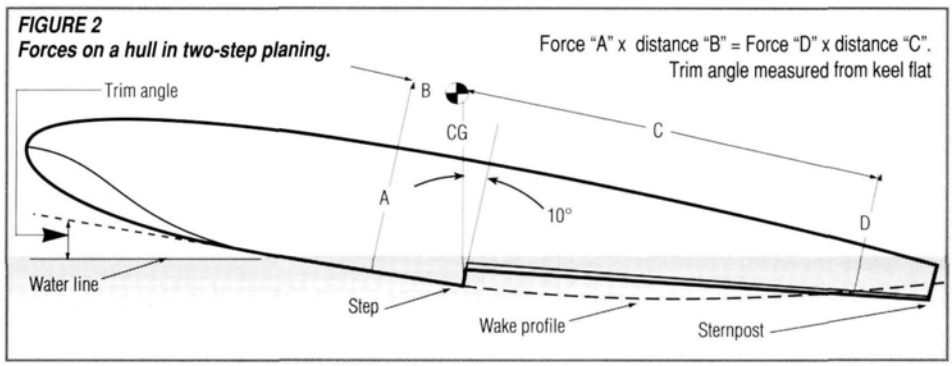
PLANING ACTION AND THE STEP

Figure 2 illustrates the step's function. Planing at speed, the forebody creates a trough in which the afterbody planes. With adequate step depth, the hull or float rides on two areas, and porpoising or skipping is minimized.

HULL DEVELOPMENT

The hull or floats described in the two parts of this article were developed by NACA sci-

FIGURE 2
Forces on a hull in two-step planing.



ILLUSTRATIONS BY DALE TREECE PHOTOS BY ANDY LENNON

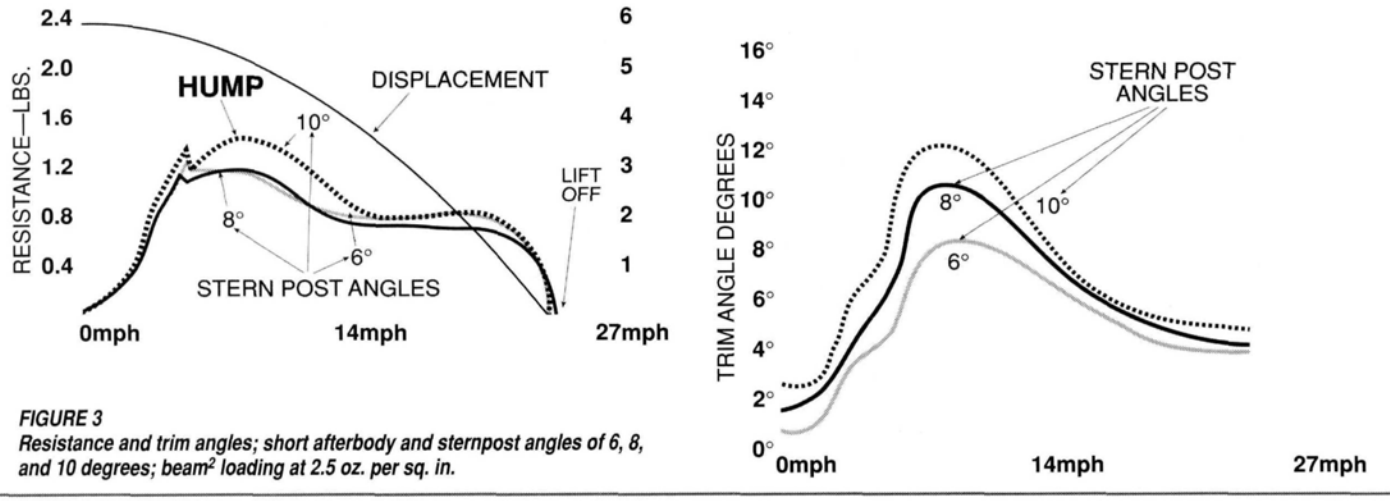


FIGURE 3
Resistance and trim angles; short afterbody and sternpost angles of 6, 8, and 10 degrees; beam² loading at 2.5 oz. per sq. in.

entists and tested in 2,000-foot-long towing basins.

Recorded were:

- Water resistance, with a range of loads.
- Trim angles, "free to trim" under hydrodynamic forces in the displacement range, i.e., up to the hump and at various controlled trim angles at planing speeds in excess of hump speed.
- Scale-wing lift forces were included in the tests.
- Spray, porpoising and skipping tests were conducted during simulated takeoffs and landings.
- Optimum CG locations, relative to the step.

Two hull or float designs were selected for this article. The dimensions of both are comparable to those of R/C model water planes.

The first design has a short afterbody that's suitable for floatplanes. The second, with a long afterbody, is suitable for flying boats. Both designs were tested with sternpost angles of 6, 8 and 10 degrees. These will be described in detail in Part 2.

THE HUMP, HUMP TRIM, AND HUMP RESISTANCE

Figures 3 and 4 provide resistance and trim angles for the short and long afterbody hull/floats. Both figures merit close scrutiny.

Note the high points in the resistance curves—known, for obvious reasons, as the "hump." Not surprisingly, the maximum trim angles coincide with the hump. Beyond hump speed, trim and resistance fall off as the hull accelerates to plane "on the step."

Up to the hump, trim is controlled by both hydrostatic and hydrodynamic forces with little effective elevator action. Beyond the hump, trim is progressively elevator-controlled as speed increases to liftoff velocity. Notable is the influence that sternpost angles have on trim angles *at the hump* for both afterbody lengths. By judicious selection of the sternpost angle, one can control hump trim angles within a fairly wide range.

The causes of hump resistance are:

- The hull is transitioning from being a floating object supported by hydrostatic buoyancy to being a planing object supported by hydrodynamic forces that act mainly on the forebody bottom, but with buoyancy still having some effect.
- The hull/float must rise from full displacement depth, floating, to its planing depth aided by wing lift as it accelerates.

STALL AND THE HUMP

If the wing's angle of attack is above its stalling angle at hump trim, the wing will stall, and its contribution to raising the aircraft will be largely lost. Stalled, the wing will lose roll damping and aileron control, and the wing floats may dig in and cause water looping.

A model wing's stall angle—at low Reynolds number, in ground effect, and with slotted flaps extended—may be as low as 10 degrees. A short afterbody hull/float with a sternpost angle of 10 degrees has hump trim of 12.5 degrees—well above the wing's stalling angle.

SPRAY

A properly designed forebody bottom and spray strips (which will be described in

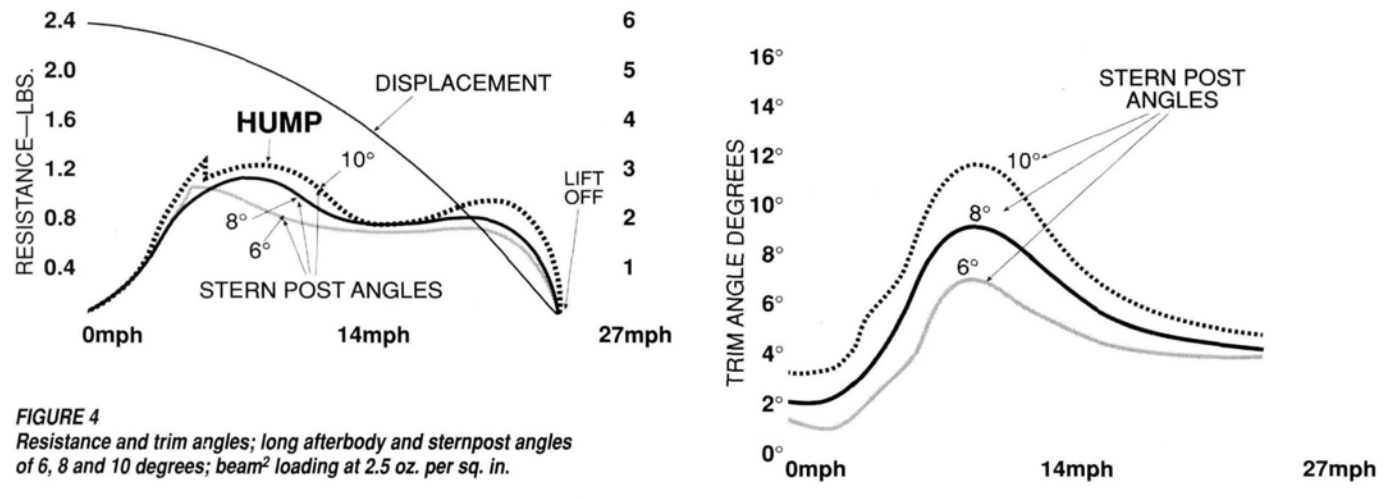
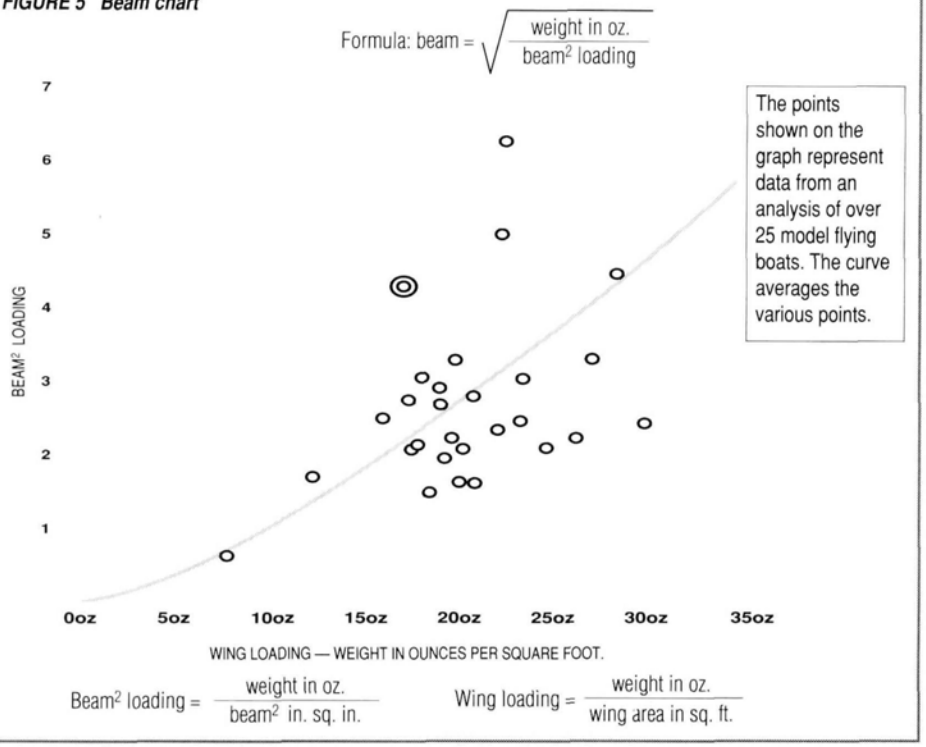


FIGURE 4
Resistance and trim angles; long afterbody and sternpost angles of 6, 8 and 10 degrees; beam² loading at 2.5 oz. per sq. in.

FIGURE 5 Beam chart



Part 2) will run very cleanly. Spray hitting the wings, tail, or propeller can slow takeoff, not to mention damage the prop. At prop-tip speeds of close to 300mph, water is pretty "solid."

BEAM

The hull/float maximum width, or beam, is critical for good water performance. *Too much beam* adds

- weight;
- air drag;
- and makes the model hydrodynamically ready to lift off *before* the wing provides adequate lift.

The Sea Gull III at liftoff. Note the clean-running hull.

Skipping and wing stall may result.

With *too little beam,* the model sits low in the water and has higher hump resistance and heavier spray. Takeoff runs are longer. Too much beam is better than too little.

A study of NACA reports on hull design indicated that a hull, planing at the wing's stall speed, should generate enough hydrodynamic lift to support the model's gross weight. Further, at this speed, the "wetted" length of the forebody bottom would roughly equal the beam. The wetted area would then be the beam multiplied by the beam (beam²).

The stall speed of a model depends on two factors: the wing's maximum lift coefficient, and its wing loading in ounces per square foot of wing area.

Model airfoils have a broad average maximum lift coefficient of 1.00, so wing loading is the major factor governing a model's stall speed. It was concluded that a planing area (beam²) relationship to wing loading could be used for float/hull-beam determination.

An empirical solution to the beam problem was developed by an analysis of the wing loadings versus beam² loading of some 25 model flying boats and floatplanes, as shown in Figure 5.

The curve in Figure 5 averages the various points and may be used to determine your model's beam as follows:

- Estimate your design's gross weight (Figure 6 will help).
- Divide gross weight in ounces by the model's wing area in square feet to provide its wing loading in ounces per square foot.
- Refer to Figure 5, and select the beam² loading that corresponds to the wing loading. For example, a wing loading of 20 ounces per square foot (horizontal) calls for a beam² loading of 2.6 ounces per square inch of beam (vertical).
- Divide gross weight by the beam² loading. The result is the forebody's wetted area in square inches. A gross weight of 93.6 ounces, divided by a beam² loading of 2.6 ounces per square inch gives a wetted area of 36 square inches.
- The beam is the square root of the wetted area. For 36 square inches, the beam would be the square root of 36, or 6 inches.
- For a twin-float plane, divide the beam in half for each float, i.e., 6 ÷ 2 or 3 inches per beam for each float. Step depth should be based on the total beam (6 inches, in this example) and would be 8.5 percent of 6 inches, or 0.5 inch for each float.

CENTER OF GRAVITY LOCATION

Figures 1 and 2 show the best CG location: along a line at 10 degrees to the vertical, ahead of the step/forebody bottom corner.

The wing's optimum location is with its center of lift (¼ of MAC) vertically in line with the CG.

PORPOISING AND SKIPPING

Porpoising is the up-and-down oscillation of the bow that occurs beyond hump speed.

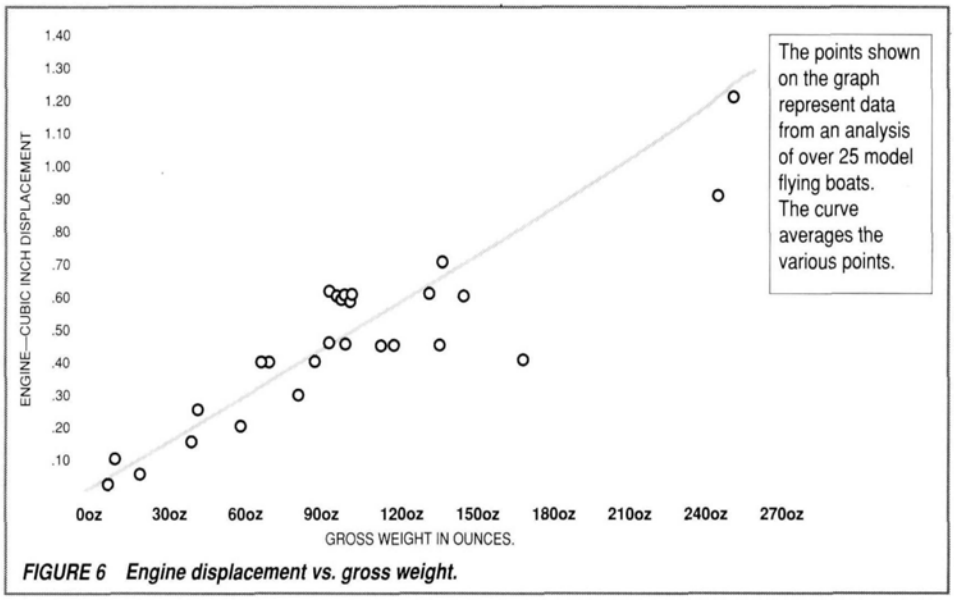


FIGURE 6 Engine displacement vs. gross weight.

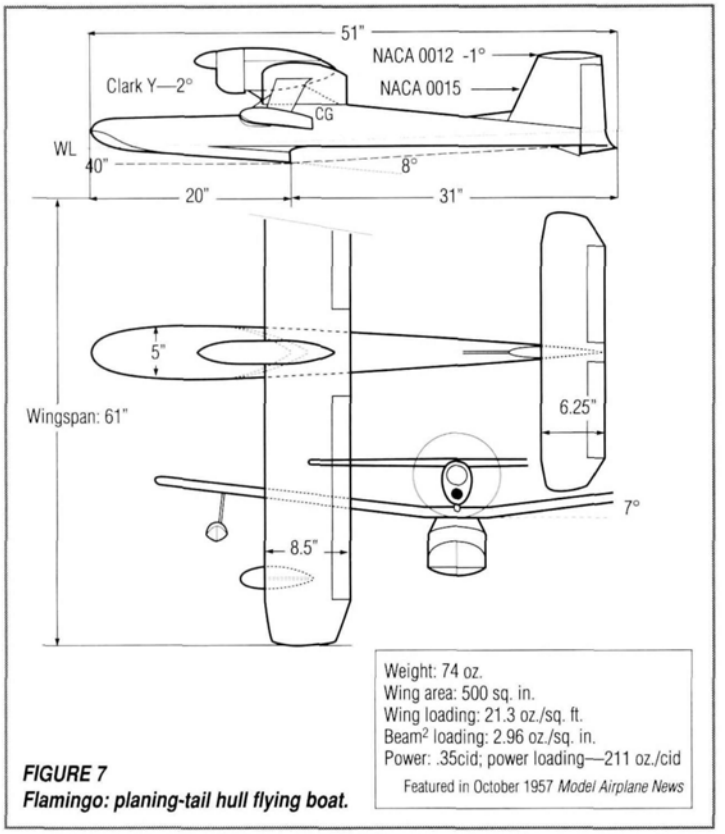


FIGURE 7
Flamingo: planing-tail hull flying boat.

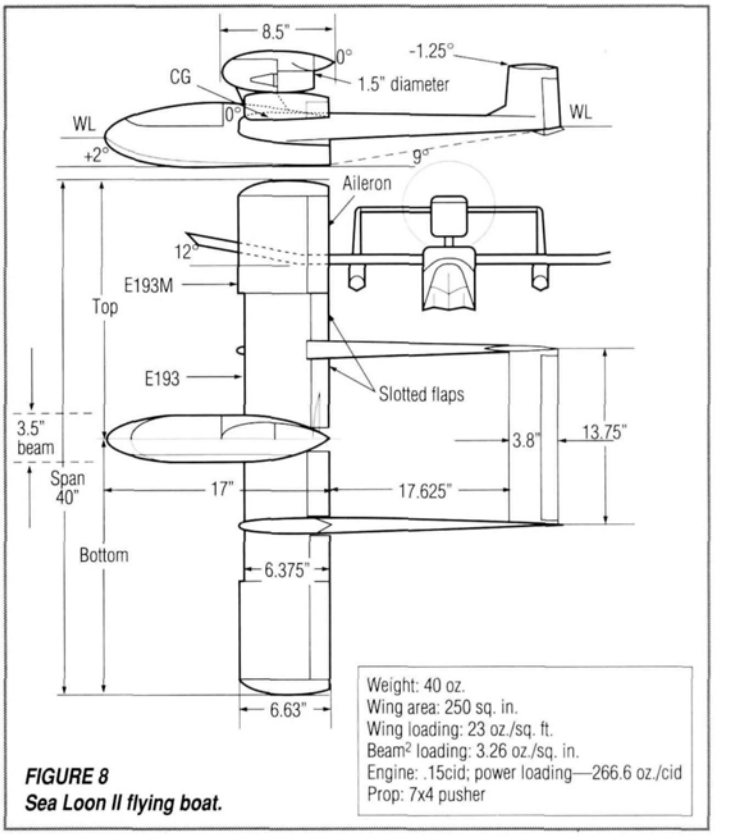


FIGURE 8
Sea Loon II flying boat.

Skipping occurs on landing when the plane touches down several times. Landing too fast contributes to skipping, but adequate step depth (8 to 9 percent of the beam) avoids both these undesirable characteristics.

PLANING TAIL HULLS

During the 1940s, in search of improved performance, NACA continued its towing-basin tests, but on a new hull form.

This hull featured a deep pointed step and a CG positioned at or behind the step. The aim was to have the afterbody contribute more to the hull's hydrodynamic lift—hence, the name: "planing tail hull."

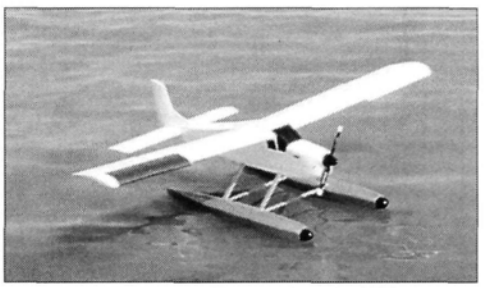
This author designed, built and flew a model with this hull—the Flamingo *(Model Airplane News,* October 1957). Powered by a Torpedo 0.15cid engine and controlled by a Babcock receiver and escapements it flew well; the hull was efficient.

Some years later, it was modernized with an O.S. Max 0.35cid engine and a 4-channel radio that provided rudder, elevator aileron and engine control (Figure 7).

One very undesirable trait surfaced: the Flamingo always weathercocked pointing downwind—not good for takeoffs! This was because of its narrow afterbody, rearward CG and deep step, all of which combined to make the model's stern sink low in the water.

Above-water side areas were well forward; *below-water* side areas were well aft. Wind striking the side caused the model to weathervane—but pointing downwind. Water- and air-rudder control tried hard to correct this condition, but the downwind wingtip float's water drag rendered these controls ineffective.

NACA tested further variations of this hull and arrived at a configuration with no afterbody, just a very deep pointed step. Two booms extending back from twin engine nacelles replaced the afterbody and carried horizontal and twin vertical surfaces at their aft ends. This concept is reflected in the author's Sea Loon II (Figures 8 and 9). It flew well (see *Model Aviation,* October 1987).



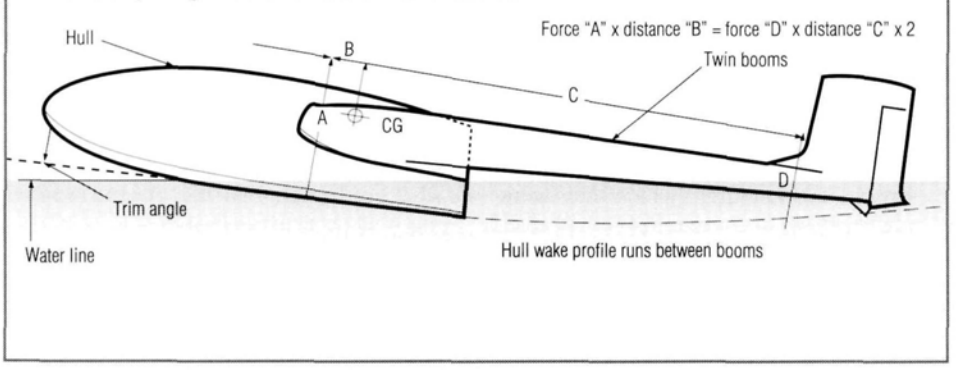
The Osprey afloat.

But the booms, which also provided lateral stability on the water, did not sink into the forebody's wake as in Figure 2, but rode on or just under the undisturbed water on either side of the forebody, as in Figure 9.

Charts 3 and 4 do not apply to this configuration. Hump trim for the Sea Loon II was established by carefully selecting the vertical-step depth to provide a 9-degree sternpost angle (Figure 8). The objective was to avoid wing stall at hump trim. Once past the hump, the twin booms were clear of the water.

Part 2 will continue float and hull design. ■

FIGURE 9
Sea Loon II—planing action of hull and twin boom afterbodies.



GOLDEN AGE OF R/C

HAL DeBOLT

THE GLIDER EXPERIMENT

HERE IN THE retirement community of Kings Point, FL, residents who retain their northern homes can rent domiciles for short periods. OT'er John Voorhees of Sidney, OH, took advantage of this and spent some time modeling and flying with me this winter. I certainly enjoyed his company.

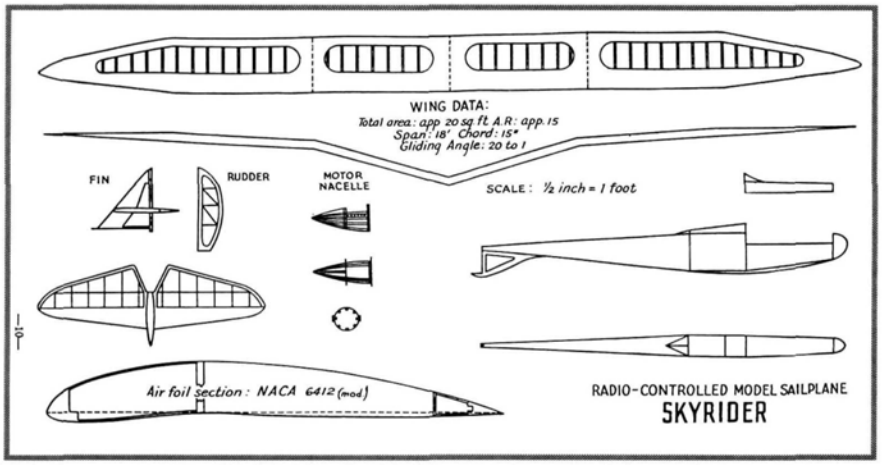
John is an avid "Golden Ager," and upon returning home, he found some interesting info about very early R/C. Call it happenchance, but some of this history ignited my memory.

When I was a youngster, I enticed my Dad into a Sunday drive to the Harris Hill glider port at Elmira, NY. Imagine my surprise at seeing three huge model gliders resting outside the administrative building. Inquiry indicated they were R/C (of all things!) and would be demonstrated when the wind abided. In retrospect, if we had waited, we might have observed some of the very first radio-controlled model flights!

I've told you about very early R/C developments credited to the Good Bros. and Chester Lanzo; even so, I knew that similar progress had been going on simultaneously in the American Radio Relay League (ARRL). Now, thanks to John, I have enough info to describe the ARRL activity. I hope you enjoy the details and manifestations!

EARLY GLIDERS

Clinton DeSoto and Ross Hull of the ARRL had contemplated R/C models and thought that a soaring glider was the best approach. The resulting glider was a monster, and launching and getting to altitude was a rare occurrence. (Perhaps Harris Hill was a hoped-for success?) Then the pair read an article describing full-scale powered gliders, and they were inspired to add power to their glider.



The Skyrider plan—one of the true pioneering R/C models.

With no prior experience to draw upon, much thought went into what was needed for the model. For example, they realized that the model should be able to adapt to a variety of R/C systems as several methods of accomplishing the objective were envisioned. The anticipated payload also led to serious structural considerations: the total R/C system alone might weigh up to 5 pounds. (Compare this to your modern multi-channel weight of a half pound or less; we've come a long way, Charlie!) Flight strength and the capability to withstand "hard landings (which they were smart enough to envision!) were also factors. All things considered, they thought that designing for a 10-pound payload would cover all possibilities. Because they wanted a glider that could soar, they projected a wing loading of 10 to 12 ounces per square foot.

ON GIANT WINGS

As you imagine, with the anticipated weight and the desired light wing loading, the result was a gigantic model glider! Thus, an 18-foot-span model with 20 square feet of area was visualized. All this to have just a single control!

I don't have a reproducible photo of the "Skyrider," but I hope that my sketch (left) conveys the beauty of the design. It wouldn't seem out of place on most modern flight lines!

The thought that went into the glider's design and structure would rival that of full-scale craft. Remember, DeSoto and Hull were in virgin territory! For example, drag reduction was accomplished with careful attention to streamlining, and an NACA 6412, low-drag, high-lift airfoil ensured lift. The sketch shows the careful attention given to aerodynamics.

The detail of the wing structure is amazing considering the time. It had two, full-depth ¼-inch-thick sheet spars that created both forward and aft "D" sections that used ⅛x⅜-inch planking instead of sheeting as today. It was truly a robust structure, yet it was said that the wing flexed noticeably under launch stress!

The fuselage structure was equally astounding. Composed of ¼-inch-thick plywood bulkheads covered with "rolled" plywood, the aft portion was 1/64 inch thick and the forward part was 3/64 inch thick. Apparently, this structure was amply strong; it survived many hard landings and mishaps.

When launching the monster glider proved a problem, Hull and DeSoto decided to add power using a Forester "99" engine. The fuselage was full of radio equipment, so the engine was mounted on a tripod above the wing. Aluminum rods supported a wooden engine nacelle in a pusher arrangement.

R/C PLANE EVOLUTION

The concept and development of the original Live Wire pointed the way to future R/C. It was the basis for all early Dmeco LW designs and kits, including the Trainer, the Cruiser, the Champion, the Rebel, the Kitten and the Yankee. These kits opened the door for the many fledgling R/C'ers.

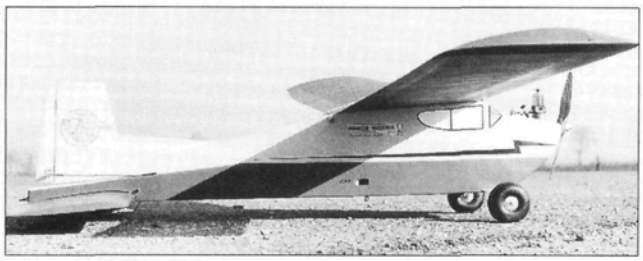
After the Live Wire had proved itself, it was made into a kit, and the industry was surveyed to find if the $15 price would be acceptable. At the time, the highest-priced CL kit was $7.95, so the "no" response wasn't unexpected. Something less costly was needed.

The only logical way to reduce the cost was by reducing the material. Thus, the Trainer—a similar design about half the size but retaining all the original features—was born. It sold beyond all expectations. R/C was finally alive, and this first R/C kit did its part—for only $7.95.

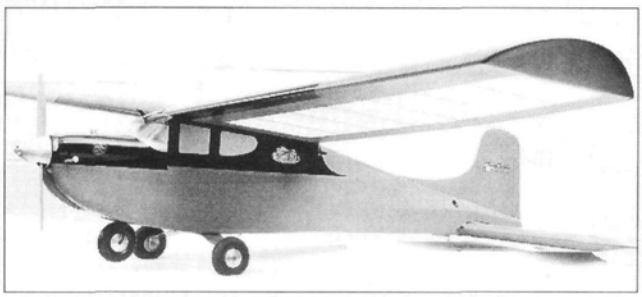
Dmeco and others thought that the original size was more practical, so a handmade trial run of the original Live Wire—called the "Senior"—was made; it sold out quickly.

This provided the necessary inspiration, so before production tooling commenced, the Senior was given a more realistic appearance. The result was the LW Cruiser, which was very widely accepted and used.

At the time, R/C engine sizes were standardized at .15 and 19. A .15 size seemed to be in order; the answer was the Champion which, with its full-scale appearance, was in production for more than 30 years! The Champ was the chosen trainer of many of today's experts.



The LW Trainer kit ignited the R/C explosion.



The Mills .08 diesel engine and the C-S 454 was an ideal combo for this original model. The cleaned-up, modernized Senior became the very popular LW Cruiser. It proved its capability at several Nats.

In production for more than 30 years, the LW Champion was the accepted trainer of many OT'ers. This is Andy Lennon's version; it's still flying after 40 years!

When Trainer sales finally slowed down, much more had been learned about R/C needs. Many experts think that the next model—the modernized LW Rebel—was the best of early R/C designs. The original Rebel had a long life and now resides in the AMA museum.

The successful LW Kitten was the first of the 1/2A-size R/C kits, and it also followed the original concept. It was followed much later by the LW Lil Champ—a half-size Champion.

Although the Yankee continued the original concept, it came much later as an attempt to simplify and reduce the complexity for R/C beginners. Featuring .09 to .15 power, it did its job.

There were many more kits in the LW series, but these early ones led many of us into R/C. They were the start of what we have today; see how far we've come!

The report indicates that power was sufficient to climb to soaring altitude in about five minutes, but it was marginal in windy conditions. At least now these pioneers were able to explore their R/C capability more consistently.

GLIDER CONTROL

The R/C portion of the project is even more fascinating. What would they use for a control actuator (servo)? In the '30s, the word "servo" had yet to be coined! DeSoto's answer was an alarm-clock gear train driven by an auto-defroster motor. The gear train rotated a disk that had an associated actuating lever; this operated a rudder "cable" system. There weren't any defined control positions; as the disk

(Continued on page 129)

CLUB OF THE MONTH

FERN PRAIRIE MODELERS
CAMAS, WA.

FERN PRAIRIE MODELERS

P.O. Box 543 Camas, WA 98607

We often get letters from club newsletter editors asking us what our criteria are for choosing the "Club of the Month" winner. It's not an easy task, that's for sure. We look for a club whose members are actively involved not only in the club but also in the local community. This could range from providing social services, such as a Toys for Tots fund drive, to introducing would-be modelers to the sport of R/C.

The members of the Fern Prairie Modelers club fit our criteria. This 11-year-old club, which consists of 148 members, is involved in Camas Days—an annual event that began in the 1890s and focuses on family and community activities. According to club president Judd Parks, this event was the club's chance "to introduce R/C flight to many newcomers, answer questions and show off our hobby." Club member Bob Barnett says that the club participates in this event in order to inform the community about who they are and what they do. They engaged in a program called "Try R/C Flying," which offers 5 minutes of stick time for $2. The fee is used to offset the cost of fuel, and any leftover money is put toward future club activities. The club has a quick basic-training class, and when fliers are ready, they're set up with a buddy box and an instructor. This year, the club had 60 registered fliers whose ages ranged from 4 to 65. The club also had a static display, and it held demo flights with aircraft that ranged from trainers to helicopters.

The newsletter features a kit review of the Model Tech Cap 21 and also stresses the importance of placing a name tag on your airplane.

Congratulations to the Fern Prairie Modelers club! In recognition of your community service, we award you two complimentary subscriptions to *Model Airplane News*. ■

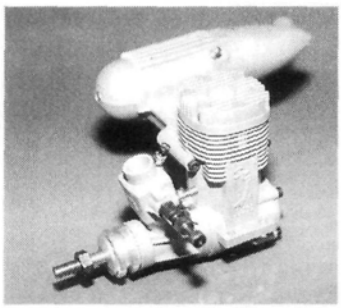
PRODUCT NEWS

TRILLIUM BALSA LTD.
Corsair

Trillium Balsa offers this 100-inch-wingspan Corsair kit, a 100-inch wingspan BF109 Messerschmitt, a 102-inch wingspan FW190D Focke Wulf and a 140¾-inch-wingspan J3 Cub. These kits consist of precut, all-wooden parts, full-size plans, a canopy, a cowl and radiators. A scale cockpit and radial engines are also available separately.

Prices—$425 (Corsair), $450 (BF 109 Me), $475 (Focke Wulf), $385 (J3 Cub), plus $25 S&H.

Trillium Balsa Ltd., 260 Tillson Ave., Unit 2, Tillsonburg, Ontario, Canada N4G 3B5; (519) 688-3522; fax (519) 688-3520.



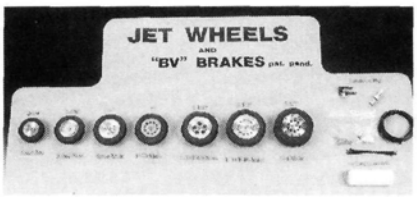
DIRECT CONNECTION R/C
DC/SP Engine

The DC/SP (sport) series of engines feature: true ABC cylinder and piston; dual ball-bearing-supported crankshaft; dual crankcase webbing around the crankshaft for added strength; Schnuerle boost porting; an easy-to-adjust, twin-needle fuel-metering carb; and a squared cylinder head that provides more surface area for cooler runs and quick break-in time. All engines come with a two-year limited warranty.

Part nos.—DC/SP40, DC/SP46, DC/SP54.

Prices—$74.95, $89.95, $99.95.

Direct Connection R/C, 562 W. Schrock Rd., Westerville, OH 43081; (614) 899-6313.

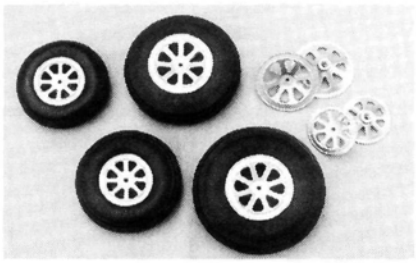


BOB VIOLETT MODELS
Jet Wheels and "BV" Brakes

BVM introduces its new line of Jet Wheels and "BV" Brakes (patent pending). The solid-rubber tires are firmly mounted on one-piece, precision-machined aluminum wheels. Eight screws penetrate each tire—rim to rim—so they can't spin off. Matched stainless-steel axles and brass bushings ensure easy running straight down the runway, and when it's time to stop, just apply the simple, effective air brakes. A single O-ring in a precision-machined groove expands to engage the wheel's inner drum surface. Scale detail is machined into the aluminum hubs or enhanced with molded plastic disks. Diameters range from 2 to 3½ inches.

Prices—$175 (Sport Jet), $195 (Sport Jet Grass), $225 (Sabre), $250 (T-33/F-80), $275 (F-16). All come in a set of three.

Bob Violett Models, 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020.



VAILLY AVIATION
Giant-Scale Wheels

Vailly Aviation has wheels for your giant-scale warbird. The hubs are made of lightweight, high-quality cast aluminum, and the centers are tapped to accept existing assembly hardware. Each hub half is drilled for 3/16-inch-diameter axle shafts and may be drilled out to accept up to ¼-inch-diameter axles. Hub sizes are designed to fit 4- to 5-inch and 5.50- to 6-inch-diameter tires. Hubs are available separately or with tires mounted.

Prices—$17.50 to $28.50.

Vailly Aviation, 18 Oakdale Ave., Farmingville, NY 11738-2828; (516) 732-4715.

CARLSON ENGINE IMPORTS
MP Jets .061 Engines

The MP Jets .061 engines are very easy to start, and they're available in glow and diesel versions in R/C and U/C (the U/C diesel version is shown). All engines feature double-ball-bearing crankshafts, and mufflers are included with each version. Specifications: bore—11mm; stroke—10.45mm for a displacement of .993cc or .061ci; weight—2½ to 3 ounces; suggested props—6x3 to 7x4. All engines come with a six-month guarantee.

Price—$60 (U/C); $70 (R/C). (The diesel or glow engine can be purchased with both R/C carbs and U/C venturi sets for $75, plus $4 S&H per order.)

Carlson Engine Imports, 814 E. Marconi Ave., Phoenix, AZ 85022; (602) 863-1684.

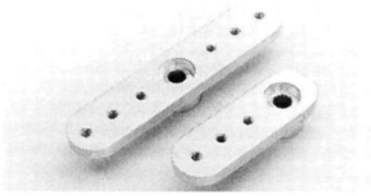
HOBBY-TEC
System Analysis Meter

The System Analysis Meter (S.A.M.) is a hand-held electronic device with an all-new approach to achieve maximum performance and safety. S.A.M. takes the guesswork out of radio installations. It checks all radio components, e.g., battery packs, servos, binding linkage, control surfaces, power switches and all connections, so you'll know whether or not your model is safe. It's easy to use and can be connected in seconds.

Price—$24.95 (plus $2.95 S&H).

Hobby-tec, P.O. Box 220762, Santa Clarita, CA 91322; (805) 254-4242.

PRODUCT NEWS



HANGAR 9
Servo Arms

The Hangar 9 servo arms are CNC- (computer numeric control) machined of aluminum. These precision metal servo attachments eliminate the flexing found on ordinary plastic servo arms or wheels. The servo wheels come in dual- and single-end versions to fit JR, Airtronics and Futaba radios. Each end incorporates three, 2mm, threaded, linkage-attachment holes for customized positioning. The arms are 2mm thick for durability and "zero flex" rigidity, and they're gold-anodized.

Part nos.—HAN 3530 (machined servo arm, dual end—JR/Airtronics), HAN3531 (machined servo arm, single end—JR/Airtronics), HAN3535 (machined servo arm, dual end—Futaba), HAN3536 (machined servo arm, single end—Futaba).

Price—$9.95 each.

Hangar 9; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

EAGLE AVIATION
Illusion

The Illusion is available in kit form, framed-up and as a builder's kit for the scratch-builder. The fuselage, wing and tail surfaces are built up with balsa sheeting. The one-piece wing has a symmetrical airfoil. The kit includes a pre-formed clear canopy, a fiberglass cowl, custom wheel pants, pre-bent landing gear and a complete hardware package. Specifications: wingspan—70 inches; fuselage length—76 inches; weight—18 to 20 pounds; engine—3.2 to 4.2.

Price—$419 (deluxe kit), $995 (built-in bones; jig-built and sanded).

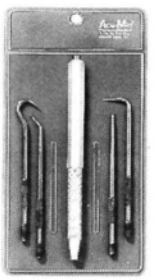
Eagle Aviation, 4573 Lamme Rd., Dayton, OH 45439; (513) 296-1290.

A.M.R. PRODUCTIONS
"Jumbo Jamboree 1994"

A.M.R. Productions adds "Jumbo Jamboree 1994" to its line of model airplane videotapes. The event takes place at Imlaystown, NJ, and it's one of the premier giant-scale model airplane events on the East Coast. This videotape features some vintage-era biplanes, modern-day barnstormers doing high-speed aerobatics, civilian aircraft, such as Piper Cubs, Piper Tri-Pacers and Cessna 152s, a demonstration of how the AT-6's team won the bronze medal in the '94 Galveston races and a display of Spitfires, Corsairs, Zeros and Tonis.

Price—$19.95 (plus $3 for priority mailing).

A.M.R. Productions, P.O. Box 1813, Toms River, NJ 08754; (609) 971-8338.



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Part nos.—58-0224 shown (with magnetic handle), 58-0223 (without magnetic handle).

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Moody Tools, Inc., 42-60 Crompton Ave., East Greenwich, RI 02818-0230; (800) 223-9036; (401) 885-0911; fax (401) 885-4565.

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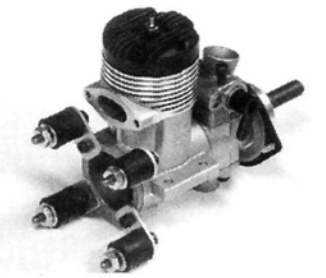
The Airplane Factory, Inc., 1880 Pineview Rd., Mandeville, LA 70448; (800) 264-7840; (504) 626-7840.



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This Vibra-Damp engine mount reduces engine vibration to extremely low levels. The aluminum-tab mount is fuelproof. The tabs, which can be rotated, will fit where most mounts won't, and they can be used for .19 to .61 engines. A nose ring and all the hardware are included. Replacement parts can be purchased separately.

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Performance Products Unlimited, 7093 E. Dodge Rd., Mt. Morris, MI 48458; (810) 631-4894; fax (810) 631-4890.

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WANTED: built or partially built Ercoupes, Cessna 150, 152, 172, 182, Grumman American Tiger (AA5), American Yankee (AA1), or Mooney M-10 Cadet. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; (714) 768-0585. [11/94]

PLANS ENLARGED. Scanning/plotting services; model designer's computer software; free information. Concept, P.O. Box 669E, Poway, CA 92074-0669; (619) 486-2464.

MAKE REAL DECALS with your computer and printer! Send $10 for starter kit and instructions to LABCO, 27563 Dover, Warren, MI 48093-4764. [11/94]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667. [11/94]

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MODEL MOTORS WANTED—Most types, 1970 and earlier. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089. [9/94]

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WW I PLANS—Peanut to 100 inches. Send $2 for illustrated catalogue to Clark Smiley, 23 Riverbend Rd., Newmarket, NH 03857. [3/95]

CASH FOR ENGINES: ignition, glow, diesel—all types; any condition; sale list, too! Estates my specialty! Send SASE for list: Bob Boumstein, 2811 S. 165th Ave., Omaha, NE 68130; (402) 334-0122. [11/94]

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JET ENGINES—pulsejets, Jet-X, Turbonique. Monthly newsletter $17/yr; $25 international; single issue $2. Catalogue $5. DOYLEJET, P.O. Box 60311-A, Houston, TX 77205; (713) 443-3409. [12/94]

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1995 ANTIQUE model airplane engine calendar—$10. Allow 8 weeks for delivery. Alan Mironer, 269 Concord Rd., Bedford, MA 01730. [1/95]

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WANTED—Senior Falcon Kit (late model). Frank Mann, 1620 Walnut Dr., Conyers, GA 30208; (404) 483-1611. [11/94]

WANTED: Old wooden kits, magazines, WW II IDs and Mfgrs. models. Bill Fornwalt, 103 Dartmouth Ave., Johnstown, PA 15905. [2/95]

GENUINE VK: Corben Super Ace kits. Limited quantity from last production run; 56-inch wingspan, 35-40 2S or 46-53 4S; $59.95 postpaid continental U.S.; check or money order only. D. Menze, 2856 Sun Valley Rd., Lisle, IL 60532. [1/94]

MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [3/95]

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R/C SAILPLANES—scale, sport, electric. SAM and NFFS powered, towline, Wakefield. F/F scale and sport powered, rubber, towline. Formerly B2 Streamlines Plans Service. Catalogue $2—all models illustrated. Cirrus Aviation, P.O. Box 7093, Depot 4, Victoria, BC, Canada V9B 4Z2. [12/94]

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Don Smith Plans, *219 Goolsby Blvd., Deerfield Beach, FL 33442; (305) 570-7551; fax (305) 570-7583.*

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FTE (Frank Tiano Enterprises), *15300 Estancia Ln., W. Palm Beach, FL 33414; (407) 795-6600.*

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Great Planes Model Distributors, *P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300.*

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I.T.P., *5621 Palmer Way, Ste. E, Carlsbad, CA 92008; (619) 431-7131.*

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Lanier RC, *P.O. Box 458, Oakwood Rd., Oakwood, GA 30566.*

Mark's Model Building, *133 Bayard St., Kane, PA 16735; (814) 837-9435.*

Micro Fasteners, *110A Hillcrest Rd., Flemington, NJ 08822.*

Midwest Products Inc., *P.O. Box 564, Hobart, IN 46342.*

Model Electronics Co., *6500 6th Ave. NW, Seattle WA 98117.*

Model Magic Products, *P.O. Box 19874, St. Paul, MN 55119; (612) 653-9548.*

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Pacer Technology, *9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.*

Pactra Inc., *620 Bukbee St., Rockford, IL 61104.*

Perma-Grit Products, *1302 Berwin Ave., Dayton, OH 45429.*

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R/C Soaring Digest, *P.O. Box 2108, Wylie, TX 75098-2108; (214) 442-3910; fax (214) 442-5258.*

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Testors Corp., *620 Buckbee St., Rockford, IL 61104.*

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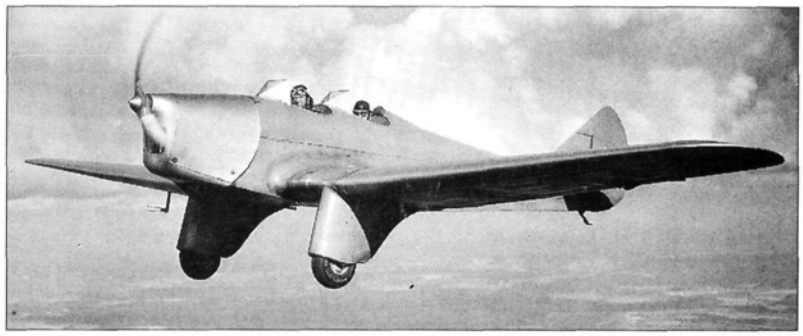
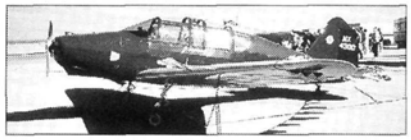
NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



CONGRATULATIONS to Pat Packard of Oshkosh, WI, for correctly identifying the July mystery plane. The Piper PT1 was produced by Piper Aircraft Co. during WW II as an entry in a primary trainer competition, but it didn't prove successful. The aircraft in the photo is a 1977 restoration of the original PT1 in Van Nuys, CA, that's now in the Experimental Aircraft Association's aviation collection in Oshkosh, WI. The plane has a 34-foot span and is 22 feet, 10 inches long. Power comes from a 130hp, Franklin 6 AC 298, horizontally opposed engine, and its maximum speed is 150mph with a range of approximately 700 miles. Its cloth-covered fuselage is made of a welded-steel-tube frame with wooden stringers added for shape. The plywood-covered wooden wing (also covered with cloth) has ailerons and flaps made of fabric-covered aluminum. Only one of these low-wing aircraft was ever built. ■



The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.

(Continued from page 112)

rotated, control was deflected in one direction, and if you released the signal, the disk stopped in whatever portion of the arc it was in. Another held signal would continue the rotation. When it was past the 180-degree point, the disk lever would move the control in the opposite direction. Thus it seems that you always had to go through one control direction to get to the other, and you never really knew what position the disk and rudder were in! Hairy, you say? There's more! With the initial 1,000:1 gear ratio, one revolution of the disk took a whole 10 seconds. As you can imagine, this created some very anxious moments, so the ratio was reduced to 300:1 (would you believe that this is our modern servo gear ratio?), and the cycle took two seconds—much more usable!

The glider's radio receiver was an example of that day's state of the art—a very basic, three-tube unit capable of consistently operating a reliable control relay. What is notable is the frequency used: 1450 KC instead of the mega-cycle range we use today. This frequency allowed the use of normal (for that day) circuits, and that particular spot was little used. It's strange, but it seems to me that there's a local AM radio station on 1450 KC today!

Of further interest are the batteries required. Would you believe that they had to use six "D" cells and two very large 45V "B" batteries—plus eight more ounces for the actuator power? The batteries alone weighed three pounds! How far we have come when two to five ounces does a reliable job today?!

Little is said about the transmitter, but I assume that such a ground-based unit would be little problem for "Ham types"—even in those days. A simple on/off RF signal key added to a standard broadcast unit would be all needed.

I hope that this description provides another example of what our early birds had to overcome. In those "golden years," the horizons were much farther away, but the excitement was even greater and the accomplishments were cherished much more than that of our modern "store-bought" R/Cs! ■

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